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A Boiler Fit for a Princess



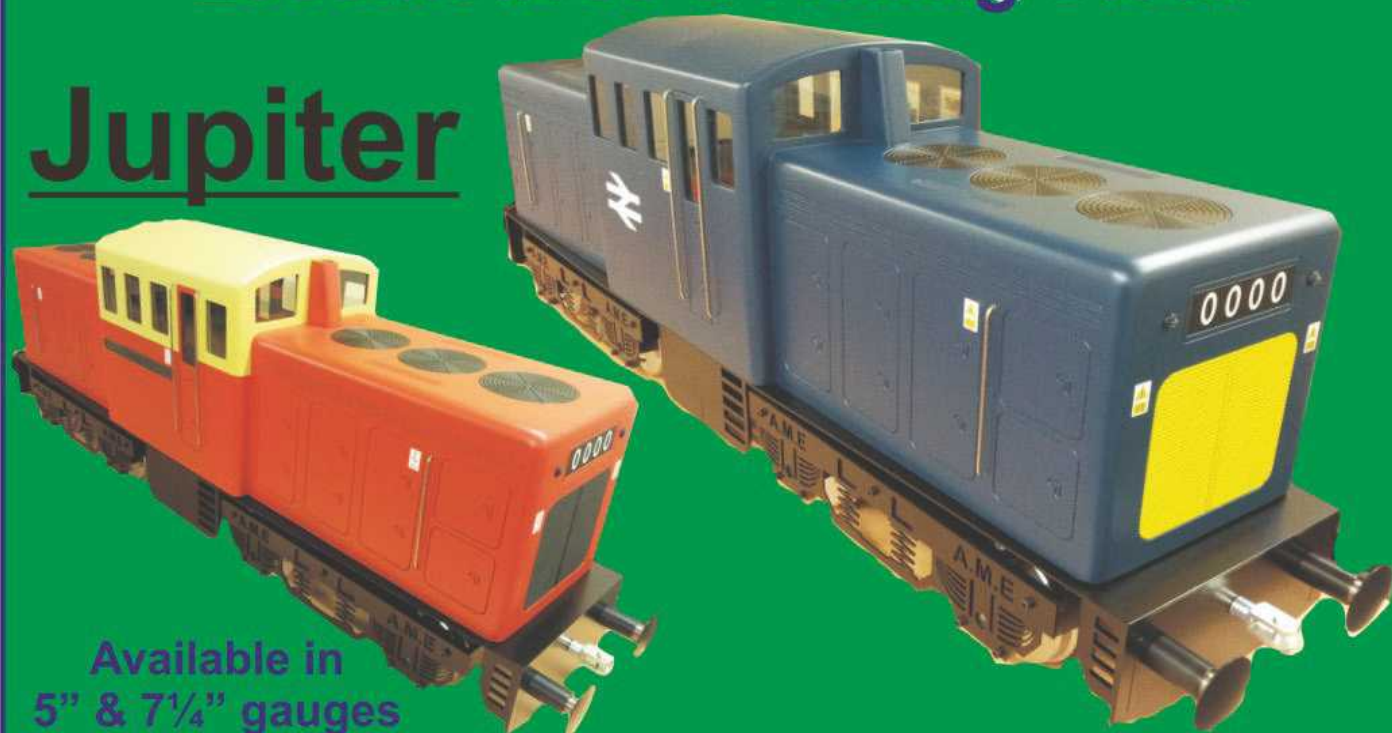
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The Stuart Major has been a much loved and often built engine over the years and this particularly fine example earned its builder, Theo Clift a Silver Medal and the Tom Nevin Trophy at the 2014 MEX. (Photo by Diane Carney.)

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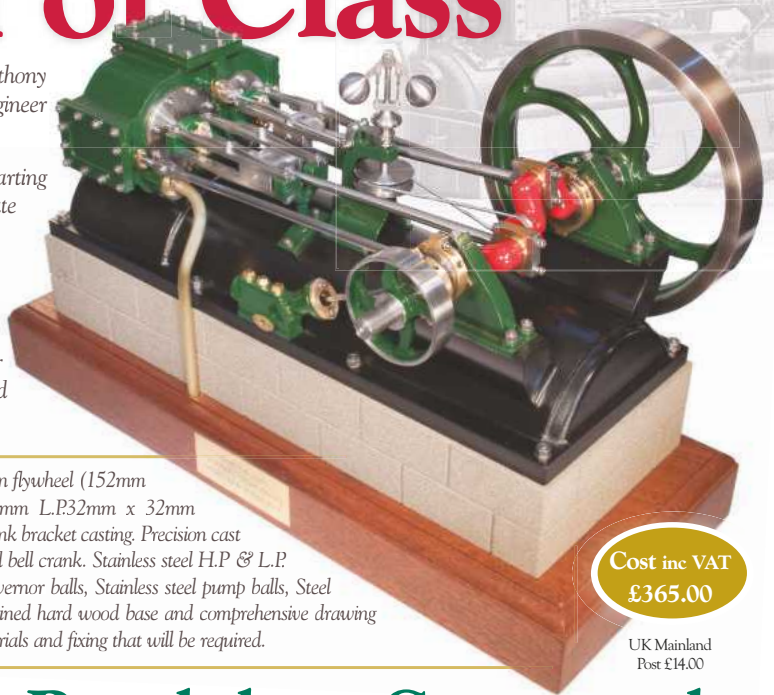
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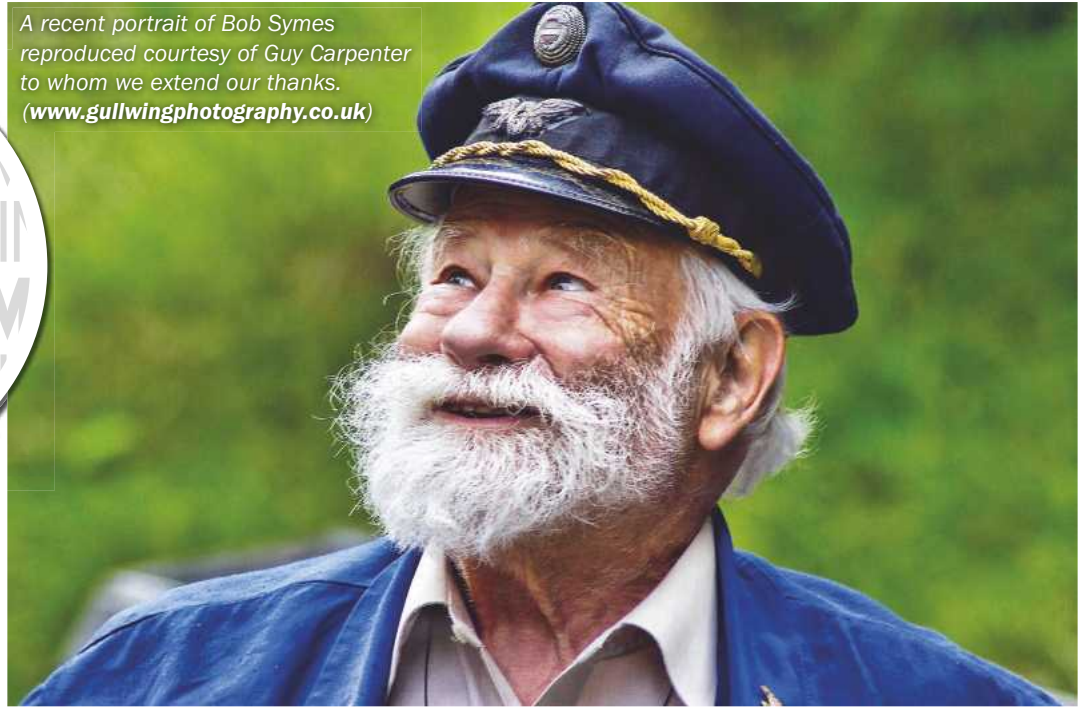
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A recent portrait of Bob Symes reproduced courtesy of Guy Carpenter to whom we extend our thanks. (www.gullwingphotography.co.uk)



Bob Symes

The world of model engineering has lost one of its greatest ambassadors in the passing of Bob Symes or - to give him his full title - Robert Alexander Baron Schutzmann von Schutzmansdorff at the age of 91. Bob was probably responsible for many a young child taking an interest in model making of all kinds as they watched intently his much loved television programmes - his own *Making Tracks* and *Model World* - and were captivated by his infectious enthusiasm as he presented familiar programmes such as *Tomorrow's World* (compulsive viewing to those of us of a certain age). His background was as a production assistant and he got his first 'break' into mainstream TV after making a short film featuring his model railway layout. It was commissioned

Bob Symes enjoys a drive at the Grand Opening of the brand new Woking Miniature Railway track on 25th May 2002. (M.E. 26 July 2002.)



as a 'filler' by the controller of BBC 2 and his foot was then 'in the door'! Bob was interested in all things mechanical and scientific but his passion was for railways and model railways in particular; he had a Gauge 1 garden railway and a splendid 10¼ inch gauge miniature railway at his home near Guildford in Surrey, where he lived until about a year ago, moving later to North Wales where his wife, née

Sheila Gunn, had been until 2006 Works Manager at the Ffestiniog Railway's engineering headquarters at Boston Lodge. Bob was a leading light in the early days of the movement to restore the 'Waverley Route' to full operation. In the late 1960s he set up the Border Union Railway whose plan was to establish a mainly freight service through the Borders. An ambitious aim at the time, he has not missed its coming to fruition by very long.

Model engineering is seldom celebrated on 'mainstream' television but Bob Symes was, by his very nature, both engaging and charming both on screen and off and was keen to promote those subjects that interested him. He opened his garden railways to the public several times year; the home baking was legendary and all proceeds were donated to Children in Need and other charities.

MEET THE EDITORIAL TEAM



DIANE CARNEY
Editor



STEWART HART
Technical Assistant



YVETTE GREEN
Designer

National 3½ inch Gauge Rally

This year's event is to be hosted by Leyland Society of Model Engineers at their splendid Worden Park track site in Leyland, Lancashire. The event will be held on Sunday 26th April with LSME members on site from around 09:30 onwards. Refreshments will be provided on the day. Visitors with engines are required to bring along current boiler certificates and spark arrestors/deflectors. More details including contact, directions, loading and steaming bay facilities details are available on the LSME webpage at www.leylandsme.co.uk and on their Facebook page.

Journeyman's Jottings

Old Engines Reviewed

Journeyman turns the pages of some historic publications.

PART 5

*Continued from page 788
(M.E. 4496, 28 November 2014)*

The journals, *Engineering* and *The Engineer* provide a wealth of material for those looking for an unusual modelling project. This occasional series will look at some less well-known designs, briefly review the contemporary description, analyse their potential and offer some interesting suggestions.

The Woodruff System of Keying: *Engineering*, September 19th, 1890.

There are often times when the simplest of ideas produces results far beyond the imagination of the innovator. As an example of this - the Woodruff Key - must surely figure in the ranks of a simple idea put to use far and wide (figs 19 and 20). When looking at this illustration for the first time, a memory was brought to mind that suggests that though simple, there are still some considerations that need to be made before being anxious to apply any form of keying to a shaft receiving from, or giving power to, a machine. By way of explanation my grandfather had bought a Woleseley Garden Tractor complete with under-slung deck mower. The machine had admittedly seen better days but started happily enough on the key. With a running engine and all gears forward and reverse working it was decided to press the tractor into service cutting the grass in a paddock. Hindsight and experience might have suggested that it would have been a good idea to check the drive system and mower deck before applying power... but the

grass never does stop growing hence that fact, coupled with enthusiasm for the new 'toy', onward went the new machine to the waiting grassland. All went well for five minutes until the vibration of older bearings, loose belts and an unrestrained drive shaft all combined to produce a sudden clatter, crunch and then silence.

The universal drive shaft had parted from the extended end of the crankshaft. It turned out that the retaining bolt and washer had been removed or was at least missing. Closer inspection also revealed that the Woodruff key was missing. This being the first and very memorable moment of encountering the Woodruff system, it was even more interesting to see how quickly the missing key was replaced. A piece of shaft was turned to a suitable diameter, parted off to a disc of suitable thickness and then sliced into a half. A brief moment of attention from a file made the new component ready for use. Once the machinery was all put back together with a new bolt and washer, the whole outfit kept running until the paddock was finally cut. The same service has been performed over and over again with no further trouble.

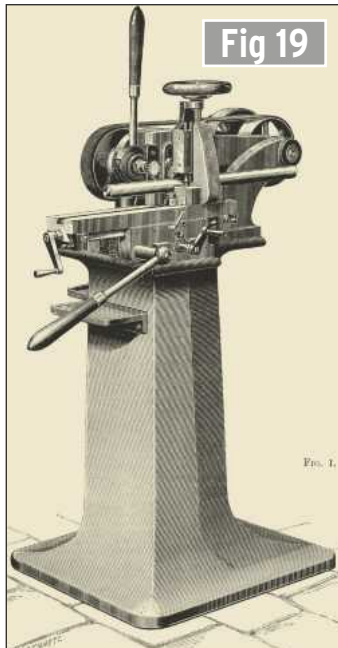
As for the Woodruff System, it was described as being 'an entirely novel system of keying for fixing pulleys, levers, and the like on to shafts and spindles'. Though invented by an American, Mr. W .N. Woodruff of Hartford, Connecticut (that not being a problem, obviously) it is noteworthy to see how many firms here in Britain took advantage of the idea. The following list wasn't exhaustive but included Mather & Platt, W. Muir & Co., Smith & Coventry, Greenwood &

Batley, Tangyes Ltd., along with Pratt & Whitney of Hartford, Connecticut. It probably isn't necessary to go into a full description of how the machine, cutter and key worked but it is worth mentioning that Woodruff had an English representative and also there that there were quite a number of sizes available. All the keys and cutters were made to standard fit within one-thousandth of an inch, the smallest being $\frac{1}{2}$ inch diameter by $\frac{1}{16}$ inch wide, the largest $1\frac{1}{2}$ inch diameter by $\frac{5}{16}$ inch wide. There were twenty-three intermediate sizes.

The modelling of machine tools has become popular in recent times, maybe this is one that could be reproduced and in such a way as to be useful for fixing keys in other projects? It is practically impossible to calculate how many machines and devices have benefitted from this idea since 1890, but a bit like the paperclip, screw thread and ball of string it clearly still has a use.

A Geometric Gyroscopic Top: *Engineering*, October 27th, 1893

Most readers have probably at some point or another played with a gyroscope. My attention to the whole idea was first drawn by a children's television programme where a large weight was spun up to speed using an electric drill on the end of a shaft and then lifted with ease due to the forces of precession inherent within gyroscopes. One later purchase at a toy shop led to both joy and frustration as initially the gyroscope did exactly as illustrated on the box, until the string snapped or the pins forming the low friction bearings popped out of position. The device was retired to the original >>



box and placed in store in the garage ... and it is probably still there.

What might now be described by some as an 'executive desk toy' seen in the illustration (fig 21) was described as follows:

'The gyroscopic toy, of which we publish an engraving, illustrates in a most interesting manner some of the most important laws of rotating bodies. The body of the top consists of a shallow bell with a heavy rim. The depth of the bell is not however sufficient to bring the mass centre of the top below its point of support. When placed, therefore, on the agate cup on which it rotates, it falls over, but on giving it a slight spin with the finger and thumb it remains upright, or on an inclined position, thus illustrating the stability of rotation. The most remarkable property of the top remains, however, to be described. It will be seen that on the baseplate supporting the cup on which the top rotates, there is also

screwed a brass standard which serves as a support for one of the geometric figures, two of which are shown separate below, whilst a third is in place on the standard. It is whilst one of these figures is in position the top is given a spin; it rotates in the ordinary way until the upper part of its spindle comes in contact with the geometric figure. When this happens a remarkable phenomenon is observed. The spindle clings to the figure and follows it along one side, round the end of the wire and back again, keeping on doing this till the speed of rotation falls too low. It is astonishing the way the spindle rounds the sharp corners at the end of the wire. Quite a considerable pressure is exerted on the wire, which has accordingly to be of comparatively stout section. When spinning freely, the geometric form being removed, the top shows the phenomena of precession and nutation very well. The makers of this little device are Messrs. Newton & Co., Opticians, 3, Fleet Street, Temple Bar, London.'

Though not an engine or boiler, this little device would no doubt make for a small but satisfying project. With maybe a few simple alterations, nothing would be beyond the ability of a novice or expert model engineer. Indeed it would make for a good turning and forming exercise. If anyone decides to try replicating this design, would they please let the Editor know?

English's Valve Gear: Engineering, March 28th, 1884.

For those who are engaged in the study and application of valve gears, here is a design that may be of some interest (fig 22).

The patent is credited to Major English, R.E. who, it might be noted, was also responsible for the design of the bogies used in the construction of the 18 inch gauge locomotives, Mars and Venus built by Vulcan as well as some of the narrow gauge products of John Fowler & Co. The Chattenden & Upnor 0-4-4 tank locomotives Lancashire and Yorkshire featured a four-wheeled version. We may return to Major English at a later time, however for now his design for an expansion gear is recorded as having been successfully applied to some engines built by Messrs. Tannett, Walker & Co., Leeds. The description is as follows:

'On the back of the main slide is an expansion slide without lap, which derives its motion from the centre point of a link connecting the ends of the main and expansion eccentric rods. The travel of the main slide is reduced, by means of a lever, to one half of the movement of the main eccentric rod, and the effect of these combined movements is to cause the relative motion of the expansion valve, compared with that of the main valve, to be always constant in amount, giving a cut-off of uniform

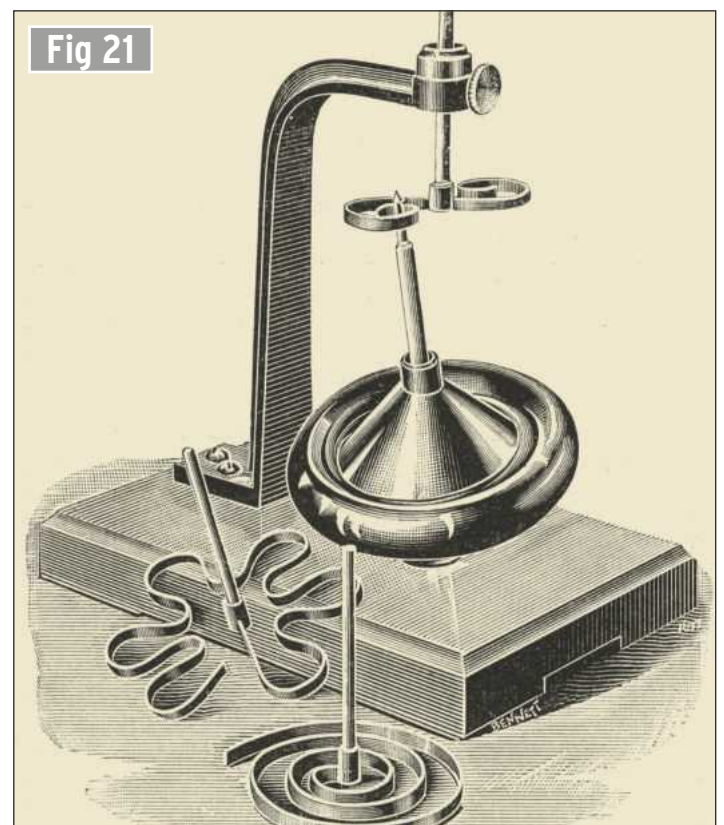
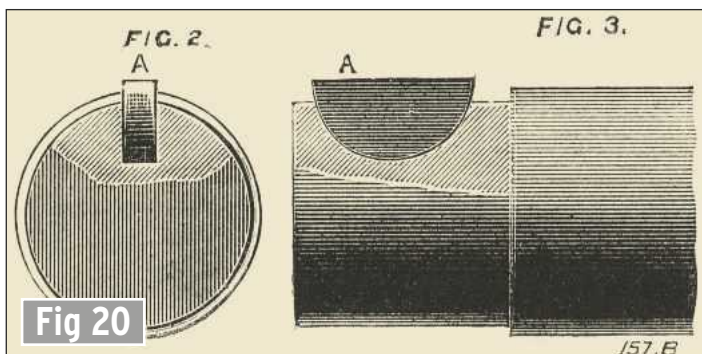
maximum sharpness at any point of the stroke, whilst the point of cut-off follows the shifting of the expansion eccentric round the shaft.'

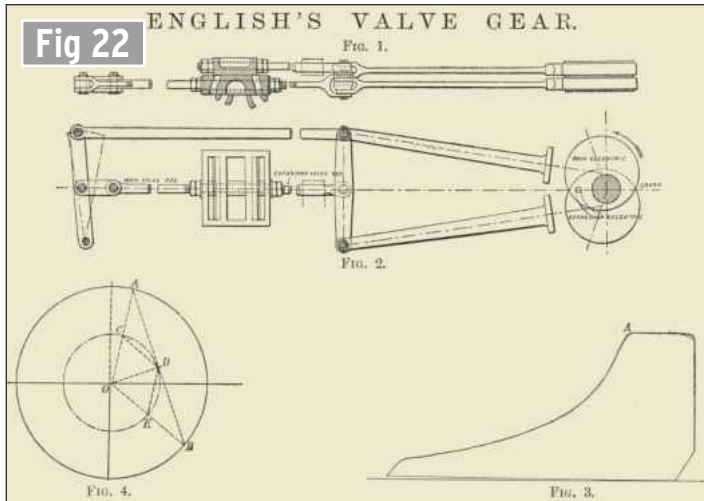
There are always methods in which the motion of valve gear can be studied and drawn so, further to the description, a diagram was also included. Students of geometry may find the following makes sense:

'We give Zeuner's diagram illustrative of English's gear, and it will be seen that the line CD remains constant in length and parallel to OB in all positions of the latter. AO represents half the throw of the eccentrics, OB half the throw of the expansion eccentric, OC half the travel of the main valve, and OD half the travel of the centre of the link. CD or OE represent half the travel of the expansion valve relative to the main valve.'

The valve gear was applied to a compound condensing engine made for the Royal Carriage Department, Woolwich, by Tannett, Walker & Co. and, in addition, to two pumping engines with which tests were carried out to measure the effectiveness of the compounding and expansion.

It was also possible to retro-





fit the valve gear to existing engines, hence should there be any stationary engine builders wanting to experiment with and modify their machines here is an example to consider.

Lowry's Gyrotory Stone Breaker: Engineering, December 16th, 1887

The application of power to work of any kind has made a deep impression upon our modern world. It would be easy to ignore or forget just how much of a difference a machine designed for a job of work can make. For a builder who has had to hand dig foundations for a house, the usefulness of the mini digger is not fully calculable.

Having built a stationary, portable or traction engine, there is always the danger of the question that is sometimes posed by the un-inspired; "It's very nice... but what does it do?"

Now the suggestion isn't being made that all modelling is fruitless but to those whose lives have been taken over by the throw away society, unless the immediate benefit or gain is seen the value of any crafted object may descend to being misunderstood entirely. So perhaps having something to drive with any engine (stationary, portable or self-propelled) makes for an additional enhancement of the hard won achievement. As one possible example, how about a stone crusher?

Illustrated in the drawing (fig 23) is not perhaps a typical design (a Marsden or Fowler crusher will appear

later in this series) but one which nevertheless poses a challenge or two and which also represents an alternative way of doing a job of work. Similar machines are still being manufactured though (as is often the case) presented as a new marvel of invention; the history books having been conveniently ignored...

It is best explained in the original description:

'In Lowry's continuous action gyrotory stone breaker the stone is crushed between a fixed and a moving cone, the latter being within the former. The action is quite different from that of a coffee-mill, although the first glance at the engraving might lead one to suppose that the two machines were identical in principle. The object of a coffee mill is to grind, while in a stone breaker grinding is particularly objectionable, as it takes the angles off the material, rendering it less adapted for road making, while it increases the amount of small stones required to be cracked, and in the machine before us this effect is obtained by making the inner cone travel round within the outer one, like a pinion in the inside of a fixed, internally toothed wheel. There is this difference, however; the two cones do not touch, but a frictional contact is maintained between them by the material under treatment. The inner cone continually rolls forward in a circular path, crushing the stone in front of it, and allowing fresh stone to fall down behind it, the small pieces dropping past it,

while larger pieces are wedged fast and broken as the cone comes towards them.

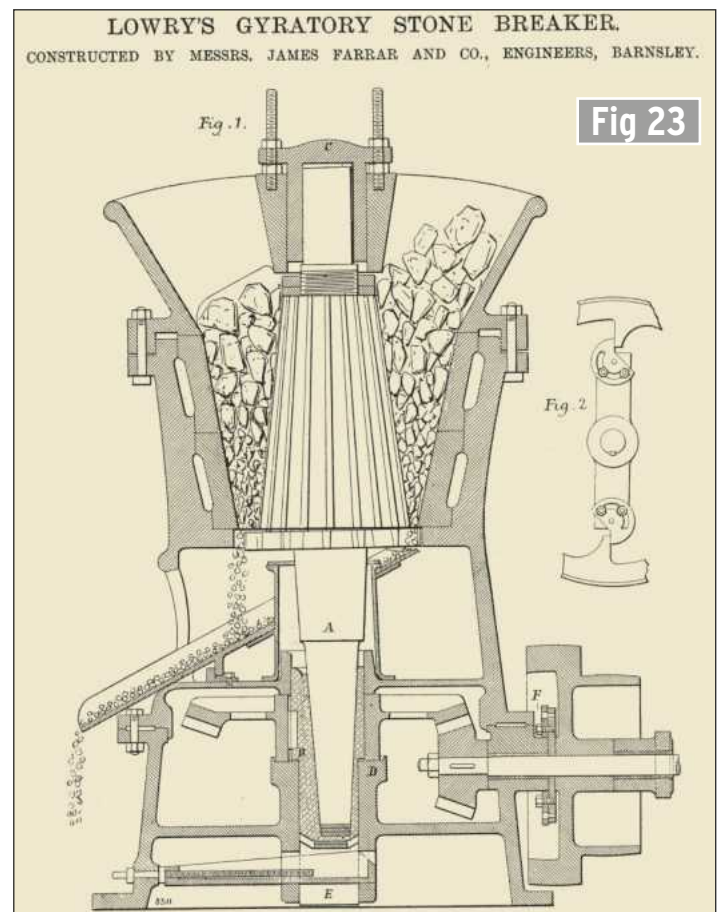
This action is attained by inclining the spindle A on which the inner cone is mounted. At its upper end it is carried in a bearing C which allows it a little play, and is fixed concentrically with the inner cone. At its lower end the spindle is supported eccentrically in a revolving footstep B, which is continually rotated by a pair of bevel wheels. As the footstep rotates it carries the axis A in a circle of small diameter, and when there is no material in the machine, the footstep and cone will rotate together. But as soon as there is stone between the two surfaces the rotating is exchanged for a rolling motion. The footstep B runs on a bottom step, which can be adjusted by a cotter. The spindle A can also be adjusted in the footstep by placing more or less discs under its toe. To prevent accidents the power is transmitted to the spindle through driving pawls (fig 2) which are secured by bolts passing through slots. When the pressure on the pawls exceeds

the friction caused by the bolts they give way and the machine stops.

The advantages claimed for this stone breaker are great crushing power, simplicity of construction, fewness of parts and ease of driving. It is provided with a hopper into which material can be tipped up to several tons, while the elevator and screen, which work in connection with it, will load a cart in 4½ minutes. We understand that this machine is used very successfully as a coal breaker, and that one weighing 4 tons will break 12 or 13 tons of anthracite per hour with a small proportion of slack. The makers, Messrs. James Farrar & Co., Old Foundry, Barnsley, have many of these machines in successful action.'

The only details that seem to be missing are any dimensions. Still, it might suit would-be builders to simply build to the size that suits their application. Consideration might need to be given to hardened materials for a working version ... and as for suitable materials to crush - there are always peppercorns!

● To be continued.



Helping Dad make a True Vertical Mill Engine



STEWART
HART

Stewart Hart describes another engine ideal for encouraging youngsters.

PART 3

*Continued from page 98
(M.E. 4499, 9 January 2015)*

This elementary engine build comes from the same stable as my *Helping Dad make a Simple Mill Engine* that was serialised in *Model Engineer* Volume 211, No. 4460, 12-25th July 2013. For anyone here for the first time, the objective is to complete a simple, low cost project that that can be made in a modestly equipped workshop with basic tooling. The intention is to stimulate further interest in pursuing this most rewarding hobby.

Marking out on a Pitch Circle Diameter (PCD) is best done with the part in the lathe. With the front and rear covers (**parts 4 and 5**) there are four 3mm diameter holes on a pitch circle of 24mm. Drill the 3mm hole deep enough so that you can make both parts. First face the bar off and just mark the centre of the bar with a centre drill and black up the face. There are a number of ways you can do the next bit. For those of you who have one of those magnetic

digital protractors, all you have to do is stick the protractor onto one of the chuck jaws, zero it, mark across the centreline with a height gauge and then rotate the chuck so

that the protractor reads 90 degrees and scribe across again. You can do this same trick - but with a spirit level. Another way is to scribe the line across then with a square on the lathe cross slide, rotate the chuck so that the line lines up with the square and mark across again. Then with a set of dividers set at 12mm it is easy enough to mark off the 24mm PCD (**photos 18 and 19**).

Use of adhesives

The design makes extensive use of adhesives. I use Loctite adhesive (usual disclaimer) for no other reason than brand loyalty from my working days but there are other equally



The completed engine.



Marking PCD using a digital protractor.



Marking the PCD using the lathe and square.

good suppliers that you may use. In describing the grade I've merely described what it does: High Strength, Bearing Fit, Thread Lock etc. so just choose the grade that best fits that description. There's definitely a knack to using adhesive; I use to tease a work friend by saying that he went to the Blue Peter School of Gluing. This was my way of saying that he used more adhesive than was required as, in fact, only the adhesive actually in the joint is contributing to the strength - the rest is just a waste.

So here are Stew's top tips for using adhesive:

Ensure the parts are clean and free from oil. (There are oil tolerant brands but let's give it the best chances to work.)

Allow a small clearance between the mating parts in the order of 0.05mm.

Use the minimum amount; put a small drop on the part and let it roll round by gravity and if there isn't enough to do a full lap, add a drop more.

Think about where any surplus will end up. By choosing what part to put the adhesive on, you will influence where the surplus will go. If you put it into a hole the surplus will move in the direction the shaft is inserted; if you put it on the shaft the surplus will move in the opposite direction that the shaft is inserted.

Give it time to cure off. Some grades will stick almost instantly whereas others will take seconds or minutes, but they will all require additional time to achieve full strength. I like to leave parts a good 24 hours in a warm room, just to be on the safe side.

If you are going to do any subsequent machining to a part held together by adhesive, remember that adhesive works better in compression, so try and arrange things so that the machining loads put the adhesive bond in compression (**photos 20 and 21**).

Pillar drill

Apart from the lathe, the only other bit of kit required for this engine is a drilling machine with about 16mm drilling capacity. In



Crankshaft assembled with high strength Loctite.



Eccentric assembled with high strength Loctite: the adhesive is applied to the hole so not to contaminate the eccentric sheath.

order to get the best out of your machine you need a reasonable drill vice. Be careful of some of the budget vices that are available; you need to spend in the region of £30 for an half decent vice so try and get one at a model engineer show, this way you can take it out of the box and have a fiddle with it and check that there is not too much play in the moving jaw. This is down to the fit of the tennon on the jaw in the vice body. You can't do much about clockwise play but tilt in the jaw can be reduced by reducing the height of the tennon. If you take too much off you can always add some shim so don't worry about attacking it with a file. To complement your vice a nice set of parallels will significantly simplify things. If your budget won't stretch to a set of parallels you can press suitable pieces of flat bar - or even square tool steel - into use. Narrow parts can be set level by a number of simple tricks. Place the part onto a flat surface, put the vice over the top and close the jaws onto the part; this way it can't be anything but level with the top



Vice placed on top of the part to clamp level with the jaws.

of the jaws. Another trick is to loosely grip the part in the vice standing proud of the jaws, place a flat object on top and lightly tap it so that it levels down on the top of the jaws (**photo 22**), not forgetting to tighten the jaws up before you drill!

Drilling machines are one of those bits of kit with which some people tend to take liberties with regards to safety. In fact, if used incorrectly, they can be very dangerous. People have a tendency to hold on to parts whilst drilling: all it takes

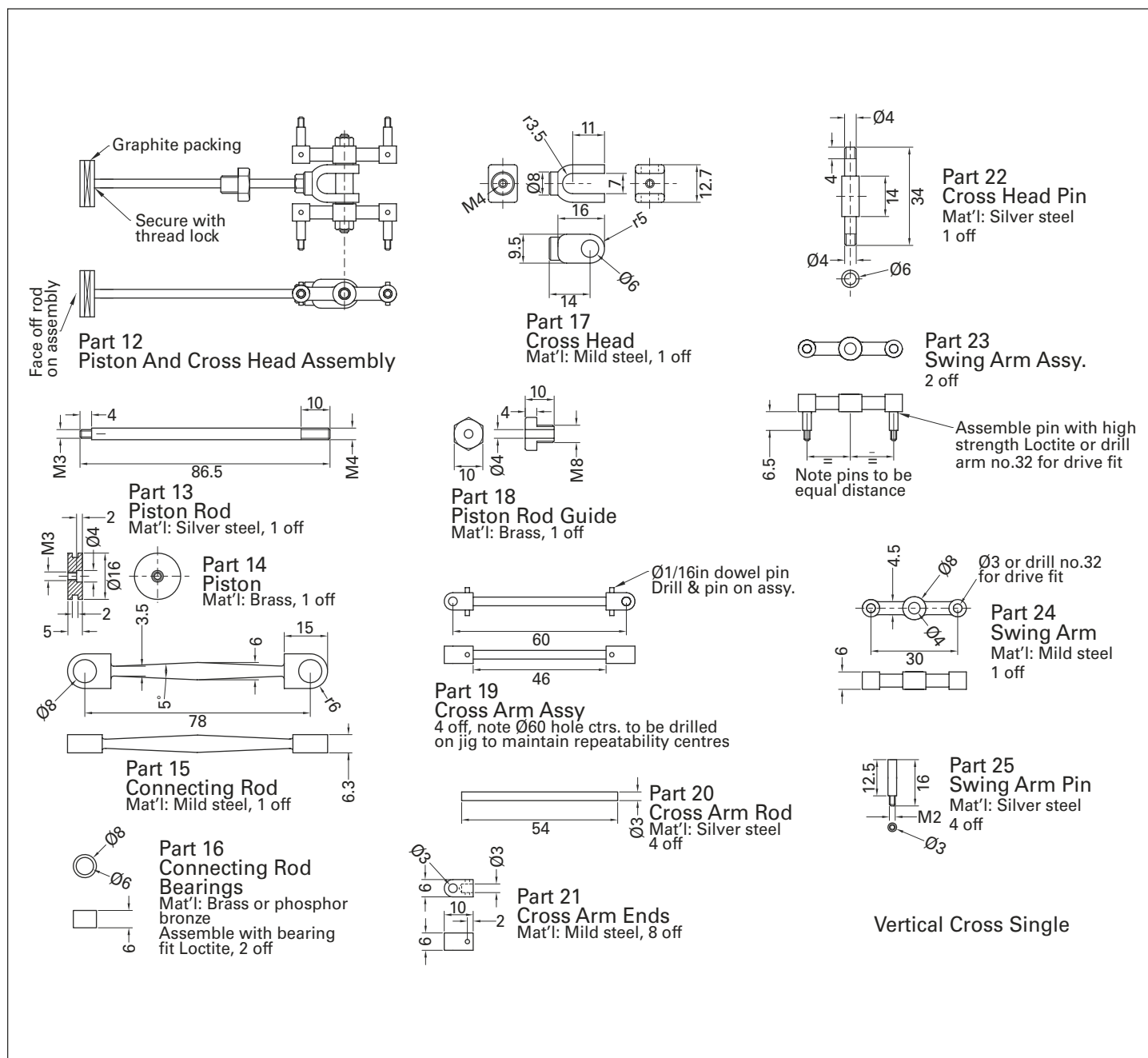
is for the drill to snag as it's breaking through and it will snatch the work out of your hand and may spin round and slash into your hand. I had a work colleague lose the tip of his thumb that way. Properly clamped work not only improves your own safety, it will also improve the quality of your work so you will need some clamping devices. A simple G-clamp is very convenient to use, or a Tee nut and bolt with a bar and packing is as good as anything (**photos 23 and 24**). ➤



Drilling with parallels and vice firmly clamped.



Using a G clamp on the drill table.



Vice stop in use.

It is also worth considering adding a stop to the vice. These can be bought commercially but they can be made quite easily; they really come into their own when you have multiple parts to make, greatly improving repeatability of work and productivity (**photo 25**).

An accurate method of locating and starting the drill off in the right place is required. The method used will be dependent on the degree of accuracy required. At it's simplest a good deep centre pop will stop the drill wandering off line but this centre pop needs to be in the correct location. There are optical

centre pop positioning aids on the market that can improve accuracy; a centre drill in conjunction with a centre pop can also be used. For improved positional accuracy you will have to resort to the good old sticky pin method. This is a simple dress maker's pin stuck to the chuck with Plasticine. With the drill running at low speed simply nudge the point of the pin with a piece of wood or a screw driver handle until it is running true. With the aid of a magnifying glass you can now use the point of the pin to accurately locate the part. Start with a centre or spotting drill then follow up with the drill.



Sticky pin.

This way the drill won't wander off position. This is the best method for accurately locating the 3mm diameter inlet and 4mm diameter exhaust ports in the engine's valve chest (photos 26 and 27).

When buying drills, again beware! Many of the budget sets on the market are not really up to the job. Most of the advertisers in this magazine supply good quality, High Speed Steel (HSS) boxed sets of drills; a 1mm to 6mm set in 0.1mm steps is all you need to make this engine, plus a few larger sizes for roughing out the cylinder etc. (photo 28).

Centre drill and spotting drills

These do similar jobs: they cut a cone to give a start and a lead to the drill proper. They come in a range of sizes so

choose a size that's appropriate for the hole you are going to drill - the bigger the hole the bigger the centre/spotting drill you want. Don't be too stingy about how deep you go - the deeper the better as you can't really go too deep. The worst that can happen is the hole will have a nice neat chamfer,



Starting with the centre drill.

which is something you can take advantage of. Centre drills have a small pilot diameter, giving a lead for 60 degree cone whereas spotting drills don't have this pilot and are ground to cut from its centre. They also come in a range of sizes with 45 or 60 degree points. I can't recollect coming

across spotting drills when I was a lad - centre drills seemed to be universally used. Spotting drills only seem to have come into their own with the advent of CNC machining, probably because they are less prone to breaking (photo 29).

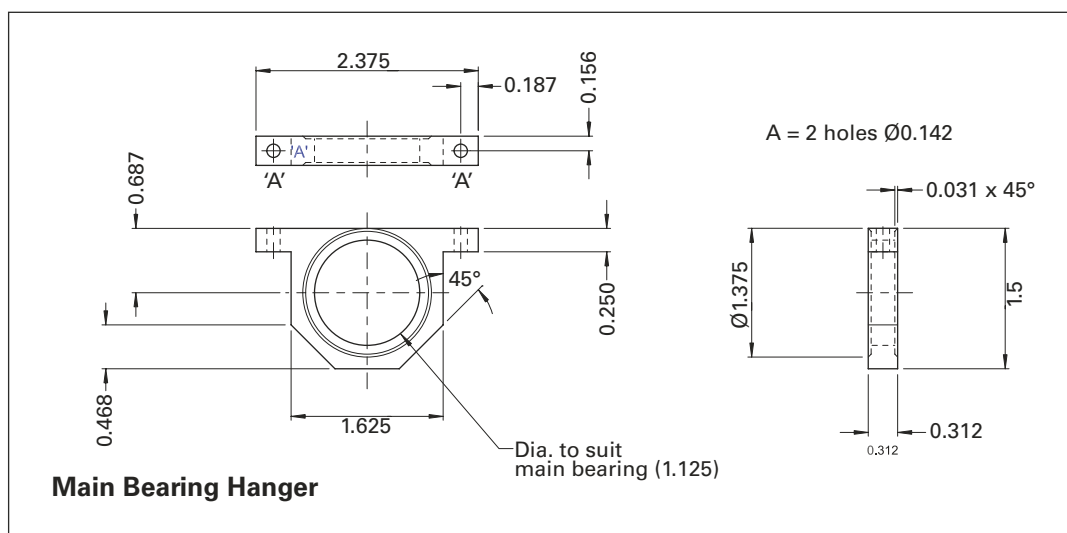
● To be continued.



A selection of high speed drills.



Spotting drills and centre drills.



FOCAS Crankshaft

Pete Worden has sent a drawing, fig 13, describing the Main Bearing Hanger, that was omitted from the final part of his article Making a Crankshaft from Offcuts and Scrap (M.E. Issue 4500).

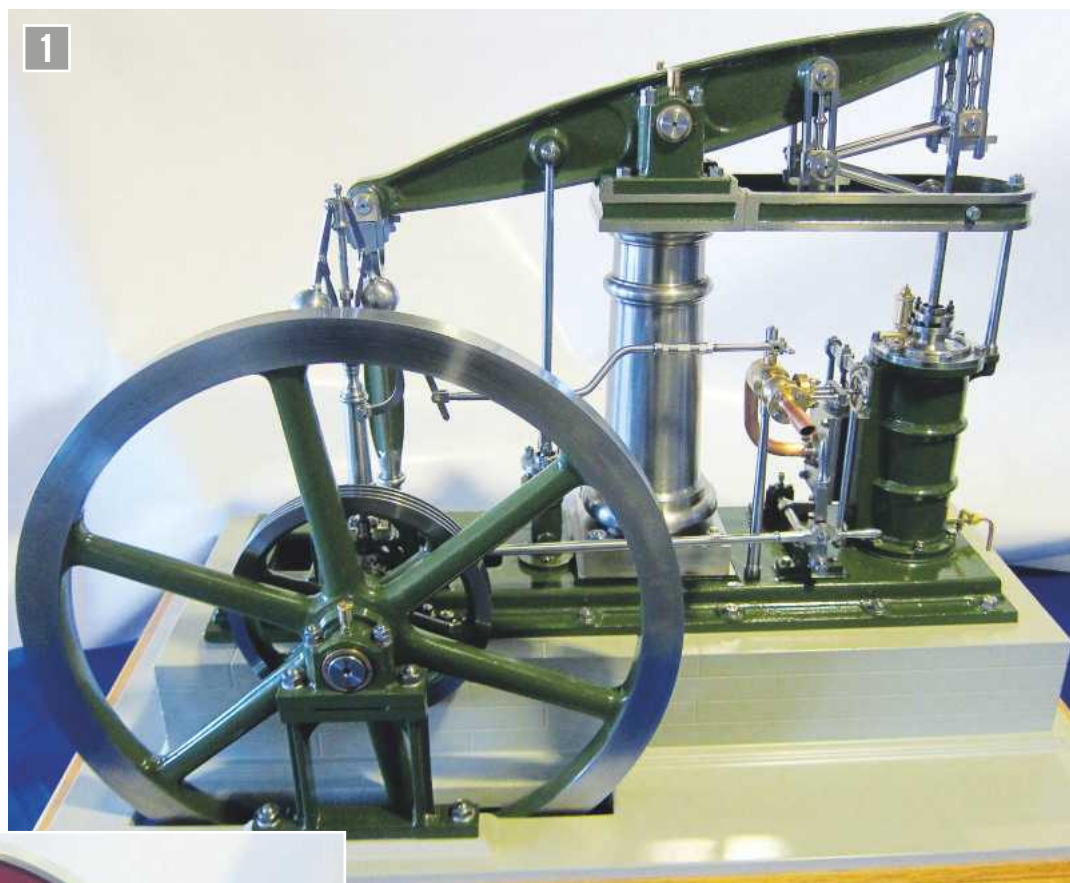
Judges Reports



NEIL
CARNEY

Neil Carney and **Mike Chrisp** judge stationary steam engines and traction engines.

1) Classes A2 and A4



McOnie single cylinder diagonal oscillating engine by Jack Wingate. A Silver Medal and the Bill Hughes Cup.



Stuart Major beam engine by Theo Clift; an excellent example of a popular design. A Silver Medal and the Tom Nevin Trophy.

Mike Chrisp and I were, as in 2013, allocated stationary steam engines (Class A2: General Engineering Models). Our task was relatively easy as regards numbers, there being only three competitive entries in the stationary engine section but the standard was as high as ever and the small number gave us the bit of extra time to admire the craftsmanship on display.

The first was the largest, a Stewart Major Beam engine made by Mr. Theo Clift (**photo 1**). It was beautifully finished and painted with just the right

amount of shine where it should be and worthy of its Silver Medal and the Tom Nevin Trophy.

Next was Mr. Jack Wingate's McOnie single cylinder diagonal oscillator (**photo 2**). This is a fascinating design that enables a few extra parts to be included in the valve gear, all of which add interest. I first came across this type of engine in the paddle steamers on the River Elbe at Dresden. They represent an elegant solution to the problem of how to give a simple harmonic motion to a valve rod which is swinging from side to side,

3



Four pillar true vertical single cylinder engine by Peter Fagg. A Bronze Medal.

from a normal eccentric (or two, in the case of a reversing gear). It works perfectly. Jacks' model incorporated all this in 1:12 scale complete with an excellent finish and paintwork. His Silver Medal and Bill Hughes Cup, of which he can be justly proud, were duly awarded.

Number three was a four pillar true vertical single cylinder engine made by Mr. Peter Fagg (photo 3). His prototype was a workshop engine made by Messrs. Benjamin Goodfellow & Co. of Hyde. The finish and paint were quite up to our expected standard, as was the workmanship throughout. A Bronze Medal was awarded for a delightful, albeit comparatively simple model.

Due to one judge not being able to attend this time, I was asked to judge the road vehicles. There were only two traction engines this year (Class A4: Road Vehicles); the large number of models that were in steam outside were not competitive.

Mr. Graham Pugh's 2 inch scale Burrell Gold Medal

Tractor was awarded a Silver Medal and the Aveling Barford Trophy for a model of very high standard with everything as it should be, beautifully finished and painted (photo 4).

Another traction engine, this time a bigger prototype but to 1:12 scale by Mr. Anthony Butler was, we suspect, from a kit but not one known to us (there were no explanatory judges notes). Mr. Butler described it as a Burrell showmans engine - and a showmans engine it certainly was but a Burrell it wasn't. The cylinders and motion were more in keeping with a Fowler but the engine did have a Burrell style chimney top. We learned, after our inspection, that this model had been made by Mr. Butler whilst convalescing after an operation and, whilst evidently a competent engineer, he does not claim to be an expert in the subject of traction engines. That said, it made an extremely pleasing model which was very nicely presented in its glass case, so due congratulations

4



Graham Pugh's 2 inch scale Burrell Gold Medal Tractor was awarded a Silver Medal and the Aveling Barford Trophy.

The Tom Nevins Memorial Trophy is awarded to an entry of a model steam reciprocating engine, either stationary or marine, which, in the opinion of the judges, best exemplifies the highest tradition of sound engineering principles and design practices.

The Bill Hughes Cup was donated by Mrs. E. Hughes to be awarded for a fine example of amateur craftsmanship in a steam powered model.

The Aveling-Barford Trophy was presented by the Directors of Aveling-Barford Ltd. for the best working model traction engine, road roller or steam wagon.

5



Tony Butler's nicely presented showmans traction engine. Commended Certificate.

to him for his efforts and he was awarded a Commended certificate.

My sincere thanks to Mr. Chrisp for his company and support whilst judging.



Neil Read judges
Tools and Workshop
Appliances.



*A modified Boxford
lathe tailstock by Ron
Wright. Commended
Certificate.*

2) Classes A5



*Nick Farr's
very elegant
oilcan on
a display
plinth. Highly
Commended
Certificate.*

The casual visitor to the recent 2014 Model Engineer Exhibition may well have formed the opinion that those workers who involve themselves in the design and making of tools and workshop equipment are a modest, self-effacing group of individuals who avoid entering the results of their handiwork in competition at all costs. A glance around the various

to inspire others in the hobby or stimulate the 'little grey cells' of the Exhibition judges. This is a pity, however the latter group must work with the material provided and so this report concerns the three exhibits whose makers were courageous enough to enter Competition Class A5.

Mr. Ron Wright, exhibited a Boxford lathe tailstock that had been modified to enable the

The care and effort lavished on this small item made us doubt that the result will ever see oil let alone be required to dispense it.

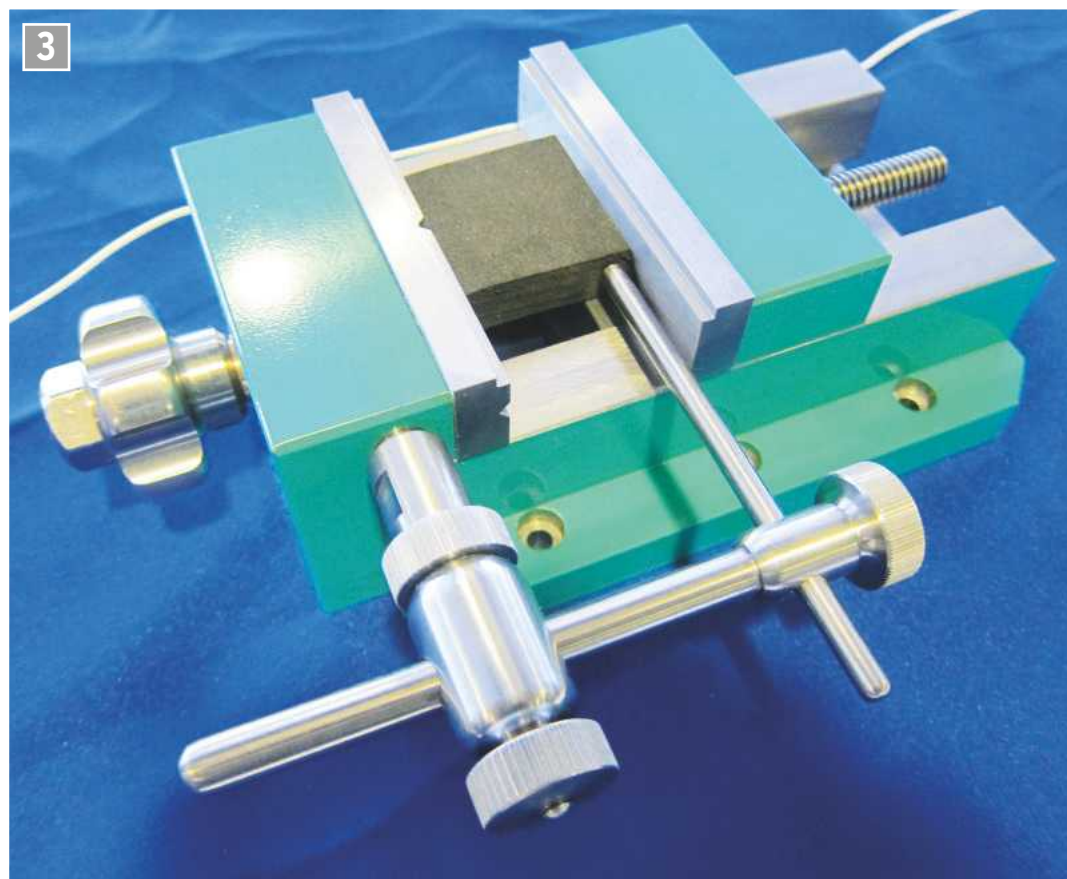
club stands would have quickly revealed some first class examples of the tool maker's art are being undertaken out there in the 'big wide world' that never manage to find their way on to the competition tables. No doubt they fulfil the requirements of their makers and are then placed in a drawer or cupboard never

use of No.2 Morse taper sleeve collets in the standard Boxford tailstock barrel (**photo 1**). Mr. Wright used commercially available, threaded rod (right hand thread) to draw the collet into its tapered seating and also provide the barrel feed. This feature means that the knurled feed nut must be turned anti-clockwise rather

than clockwise to advance the drill or other cutter mounted in the collet. If we have interpreted the drawings correctly, it also means that the mechanism must be dismantled either to change the collet or lock the chosen drill into position, which must be regarded as a disadvantage. The external features of the design were well made and finished and no doubt will provide the sensitive feed facility Mr. Wright was seeking. His efforts were deemed worthy of a Commended Certificate.

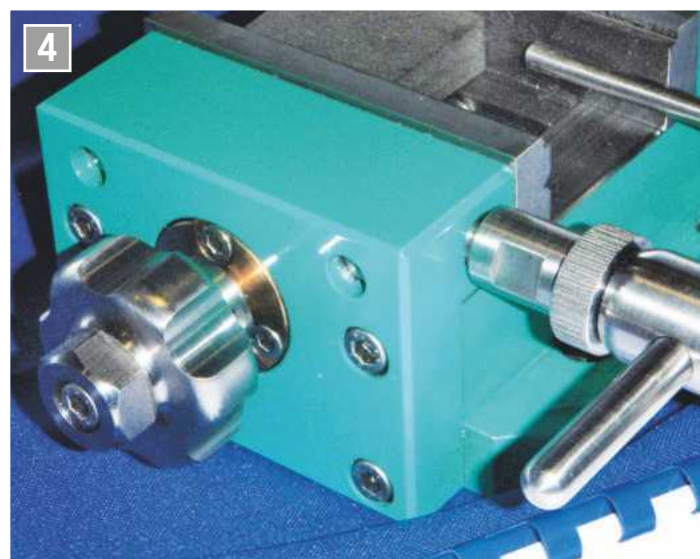
Mr. Nicholas Farr presented the judges with a miniature oilcan and also a minor problem (**photo 2**). The care and effort lavished on this small item made us doubt that the result will ever see oil let alone be required to dispense it. Rather, we suspect, it will spend its days in a display cabinet. Nevertheless it was judged as a fully functioning item as, no doubt, it would be able to perform if required. The inspiration for the exhibit was drawn from an article in issue 220 of *Model Engineers' Workshop*. The silver soldering of the oil container had been neatly and unobtrusively carried out. The forming of the material attached to this to provide a stand had also been done well. The oil spout and its knurled locking ring had been machined and fitted to a good standard. As has already been indicated, the ensemble was well polished and presented on a display plinth. It was awarded a Highly Commended Certificate.

The third and final entry in this class was the CNC Machine Vice designed to provide fixed X & Y axes of Mr. Michael Checkley (**photo 3**). The connection to computer numerical control (CNC) machining rather eluded us but was believed to refer to the work placement stop incorporated into the design. This would, of course, be of equal utility on a manual machine as well as a CNC one and has been a feature of commercial machine vices for years. The design is one currently being serialised in



A CNC Machine Vice to his own design by Micahel Checkley. Commended Certificate.

Model Engineers' Workshop and Mr. Checkley provided no judges notes, although part drawings were supplied. The individual components comprising this exhibit had all been carefully made, fitted and finished. The paintwork applied was appropriate and to a high standard. The 'fixed jaw' is connected to the main body by four M5 screws (**photo 4**). Though traditionally the fixed jaws of machine vices are integral with the main body a similar feature is not unusual on precision, modular vices. The average tensile strength of each individual screw would be approximately 1,850 kgf and thus not a problem for a light duty vice. Of more concern was the main screw and nut chosen for the vice. These are commercial items, the screw being only 10mm in diameter with a 2mm pitch Acme style thread. The torque to lock the work between the jaws is applied through a nut/hand wheel fixed to the shaft (7.2mm diameter) of the main screw



A close view of the fixed jaw.

by two grub screws bearing on flats and held axially by an M5 cap screw. The design of the vice is such that the screw is in tension when in use. It was felt a larger diameter screw with an integral locking arrangement would provide more secure, durable service. Mr. Checkley is clearly a competent machinist and it was felt a pity he had not exercised his talents in turning something more suitable. These concerns reduced

the points allocated to this entry and, after discussion; it was awarded a Commended Certificate.

The thanks of the judging team are extended to the competitors for their entries and, in particular, to those who provided detailed notes for us. It is easier to understand an entry if the features and motivation behind it are set out for us to read.

● To be continued.

Ships Galore



HMS Warspite to 1:96 scale by David Brown. Gold Medal and the Earl Mountbatten of Burma Trophy.



A closer view of the central deck area of HMS Warspite.



DIANE CARNEY
Editor

Diane Carney looks at some of the award winning ship models.

One section of the loan and competition room that was packed to overflowing at the 2014 MEX was the boats and ships models. It really was a tremendous display and we are grateful to everyone who took the time to bring along what are, in some cases, rather fragile models. The visitor could have easily spent the whole of his day in this room and still not seen everything.

Three trophies and a total of three Gold and two Bronze Medals were awarded to entries

in classes C1 to C9. Let's look firstly at the winner of the Earl Mountbatten of Burma Trophy. David Brown exhibited an extremely fine, totally scratch built model of Queen Elizabeth Class battleship, *HMS Warspite* in 1:96 scale (**photos 1 and 2**). David has chosen to portray the ship as it was in about 1931/32, ten years earlier than the larger scale model by Colin Vass. David says that it is probably not quite accurate in terms of the 'activity' depicted taking place on board, as it is not really true to life to have had

so many tasks being undertaken at the same time. We can forgive him that however, for as a highly detailed model of a battleship it is surely one of the best ever seen. I hope the photographs go some way to showing why the judges awarded David a Gold Medal and the prestigious trophy.

A Gold Medal was also presented to Alex McFadyen who had put on a remarkable display of Naval models including *HMS Vanguard*, *HMS Anson* and *HMS Barrosa*, all of which have been Gold Medal winners in the past, but it was for his 1:96 scale model of the French battleship *Richelieu*, depicted as she would have looked in 1946/47 that his award was made this time (**photos 3 and 4**). Alex had invested between ten and eleven thousand hours in this model. Laid down in 1935, *Richelieu* sailed to Dakar in French West Africa when 95% complete - a movement intended to avoid her capture at her place of birth in Brest - just days before the French surrender in June 1940. Fearing the consequences of the refusal of Vichy France to



Richelieu, a French battleship in 1:96 scale by Alex McFadyen.



Close detail of *Richelieu*; she featured a main armament of eight 380mm guns in two quadruple turrets.

The Earl Mountbatten of Burma Trophy is presented for the best overall Naval model exhibited.

The H. C. Evans Trophy was donated by the Thames Shiplovers Society in honour of its founder, H. C. Evans to be awarded annually at the discretion of the judges for research and/ or presentation of a model ship.

Model Boats Kit Class Trophy was donated by *Model Boats* magazine for the best kit built boat

decommission the ship, the British were forced to take action and launched a pre-emptive strike against *Richelieu* at her berth in Dakar, rendering her disabled as a result of a torpedo strike to her stern. In 1942 the French forces in North Africa joined the Allied effort and the *Richelieu* was later sailed to New York for repairs and refit, spending the remaining war years in service with the British Pacific Fleet.

Roger Hoare, a respected builder of ship models for many years, was awarded a Gold Medal for his model, in 1:144 scale, of the Battle Class Destroyer *HMS Barrosa*, built by John Brown in 1945 as depicted as she was then. As this lovely model was displayed in a glass case it was difficult to photograph but I hope that **photo 5** does it some justice.

A Bronze Medal and the H. C. Evans Trophy was presented to Stephen Duckworth for a beautiful 1:48 scale model of the famous *Turbinia* in dry

dock (**photo 6**). This trophy being specifically awarded for 'presentation', Stephen was well deserving of it, as the photo shows. Launched in August 1894, *Turbinia* was one of the most important ships in history. The first steam turbine propelled vessel ever built she was an experimental ship produced by Charles A. Parsons' Marine Steam Turbine Company and built at Brown & Hood's at Wallsend. Her audacious appearance - unannounced - at Queen Victoria's Diamond Jubilee Naval Review in June 1897 is well documented and makes a wonderful story to this day. Never before had such speed been witnessed: the Admiralty took a keen interest!

A last look at the ships models for now and a Bronze Medal and the Model Boats Kit Class Trophy was presented to Keith Nowell for his Edwardian Steam Launch, *Topaz* exhibited in Class C9 (**photos 7** and **8**). I am afraid I have no further



Battle Class Destroyer HMS Barrosa by Roger Hoare. 1:144 scale. Gold Medal.



Turbinia in dry dock by Stephen Duckworth, 1:48 scale. A Bronze Medal and the H. C. Evans Trophy.

notes about this model but who could fail to be drawn to such a lovely subject? Keith's added detail in the form of

a Windermere Kettle, a tool kit and china in the cabin will have contributed greatly to his high marks. **ME**



Edwardian Steam Launch, Topaz by Keith Nowell. Bronze Medal and the Model Boats Kit Class Trophy.



Keith has added some endearing details to this well made kit.

Making the R & B Engine



IAN STRICKLAND

Ian Strickland revisits a *Model Engineer* design from 30 years ago.

PART 7

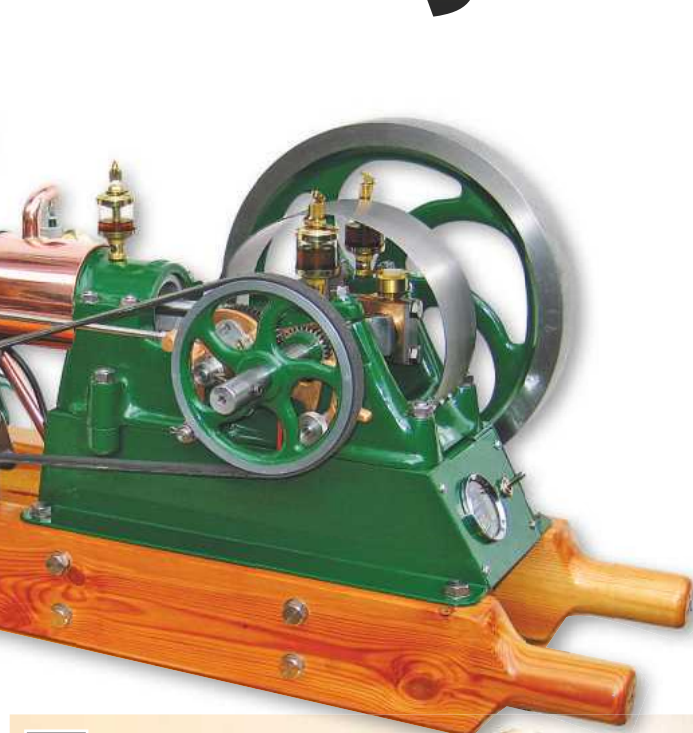
Continued from page 121
(M.E. 4499, 9 January 2015)

Castings and drawings for this engine are available from Polly Model Engineering Ltd, Atlas Mills, Birchwood Ave, Long Eaton, Nottingham, NG10 3ND. Tel. 0115 973 6700. www.pollymodelengineering.co.uk

My intention in writing up this project was to give more of a blow-by-blow account for budding constructors of the R & B Engine, especially for the larger parts, as the original articles were a little light on constructional detail but contained all the plans.

Water jacket

Set up the dividing head to drill the six $\frac{5}{16}$ inch holes in the water jacket end plate (**photo 121**). Note the use of a stub drill, which won't wander as might a standard length drill.



Drilling the water jacket end plate.



Shallow groove to facilitate aligning the jacket.



Holding the water jacket in the vice to saw off the excess end plate.

Transfer the chuck to the lathe spindle to machine a shallow groove to assist in aligning the jacket for silver soldering. Also machine out the centre to 2.260 inches diameter (**photo 122**). In **photo 123** is my set-up for holding the water jacket in the vice using two M8 bolts and nuts through the cylinder head stud holes, without causing damage while hacksawing off the corners after the initial silver soldering. The jacket was then refitted to the cylinder mounted between centres, as before, to tidy up the hacksaw

edges. **Photograph 124** shows the set-up for boring the holes for the pipe connections.

Photograph 125 shows the completed water jacket all silver-soldered together. It was later found that the lower copper outlet almost fouls the engine base casting, so a reheat was necessary to twist it round about 20 degrees.

Fitting the cylinder to the base casting

Having machined and lapped the cylinder, it is now time to machine the engine base casting to accommodate the cylinder. **Photograph 126** shows the initial set-up to mill out the longitudinal clearance. In **photo 127** can be seen the use of the smaller 'outrigger' to secure the crankshaft end, while the bigger 'outrigger' was used as the guide for the reference edge. Lastly, **photo 128** shows the use of the boring head to form the radiused relief to clear the underside of the cylinder. The boring head is set to turn a radius of a 1.5 inch. Do not drill the holes for the cylinder fixing studs until the piston has been made and fitted to the connecting rod. After which, spot through the cylinder fixing holes as before (see photo 80) with the pointed rod, then drill and tap M8.

Cylinder head

This is another iron casting. First of all, power wire-brush it to remove the remnants of foundry sand. When measured, it was found to be dimensionally a bit light from top to bottom so some adjustment of dimensions was needed. First, mount it in a 6 inch, four jaw chuck to face the underside, (**photo 129**). Then reverse it, taking care to centre it on the outside rim. Skim the top of the cylinder head where the valve guides will eventually be fitted. Then turn the 2.45 inch diameter for the surface on which the cylinder head nuts will sit (**photo 130**). I kept to the specified 1.2 inch dimension from this surface to the datum on the underside of the head to accommodate the inlet and exhaust ports



Set-up for boring the holes for the pipe connections.



The completed water jacket.



Machining the base casting to receive the cylinder.



Crankshaft end clamping detail.



Forming the relief for the underside of the cylinder.



Facing the underside of the cylinder head.



Turning the top of the cylinder head.



Stud holes drilled.

etc. Next, transfer the four jaw chuck - with the cylinder head still mounted - onto the dividing head to drill the M8 ($\frac{5}{16}$ inch diameter) stud holes on a 3

inch PCD. Because the bolt lobes were not symmetrical, some averaging was needed to best position the stud holes. But as can just be made out in

photo 131, the three lower stud holes are somewhat off centre in their lobes. Care had to be taken when drilling four of the holes as they are very close to

the chuck jaws. The lower parts of these four holes were drilled out, after the head had been taken out of the chuck. Owing to the proximity of the chuck jaws, it was not possible to ream the holes as recommended in the original article.

Ron Acock in his articles (ref 2) recommended making a transfer block on which to mount the cylinder head to facilitate the various drilling and milling operations. I used a 3.75 inch square billet of $\frac{3}{4}$ inch thick steel. This was milled until the four sides were the same length and square with each other. Then it was mounted on the dividing head and six M8 holes were drilled

and tapped on a 3 inch PCD. It was set square so that two holes were on the horizontal centreline, while the other four were parallel to the top and bottom edges (**photo 132**). This ensures that the inlet and exhaust port faces are parallel to their respective sides of the block; and this can be seen in **photo 133**. The exhaust and inlet port faces are next to be cleaned up, (**photo 134**), set up on the lathe cross-slide. The transfer block was aligned with the left hand edge of the cross-slide. Next, mount the assembly in the four jaw chuck, centring the transfer block, then turn off 0.075 inch on the underside

to a diameter of 3.750 inches (**photo 135**). Next, form the shallow combustion chamber 2.188 inches diameter by 0.043 inch deep. Using the digital height gauge, mark out the centrelines for the inlet and exhaust valves, their ports and the sparking plug (**photo 136**). Owing to the slight misalignment of the inlet and exhaust port bosses, the location of the exhaust valve was increased to about 0.570 inch from the centreline, instead of 0.500 inch as shown on the plans. This will involve some adjustment of the exhaust valve rocker location. Notice the scribe on the height gauge had to be turned

though 90 degrees in order to scribe the outside faces of the ports.

Next, mount the transfer block on the vertical slide, so that the inlet and exhaust valve chambers can be drilled and bored, the valve guide holes reamed and the sparking plug hole tapped M10 x 1mm. Note the use of 1 inch long spacers between the cylinder head and the transfer block to enable drilling and reaming to be completed without fouling the transfer block (**photo 137**). The 45 degree valve seats were formed later with the assembly mounted in the four jaw chuck (**photo 138**) as the arrangement shown in photo 137 produced an included angle less than 90 degrees. Note that in photo 138, the underside of the tool had to be relieved to clear the valve seat below the cutting tip.

Reverse the head to bore out for the sparking plug recess. The sparking plug originally recommended is apparently no longer available so a Champion Z9Y was fitted instead. The original plug was a long reach variety, (the threaded part being about 0.637 inch long), so the recesses for the Z9Y plug in the cylinder head had to be a lot deeper than shown on the plans and got perilously close to the valve chambers. The sparking plug is shown on the plans 0.813 inch from the centreline, but this I reduced by 0.075 inch to keep the boring away from the head bolting down face. I was glad I did this because the larger diameter to accommodate the sparking plug socket spanner only just fitted within the cast edges of the cylinder head (**photo 139**).

Now drill and bore out the inlet and exhaust ports. **Photograph 140** shows how the transfer block was set up on the lathe cross-slide, so that the port centrelines coincided with the lathe axis. Both ports were finish bored to 0.625 inch diameter. The exhaust port was tapped $\frac{1}{2}$ inch BSP as shown on the drawings. File away the sharp edges in the inlet and exhaust ducts to ease the gas flow.



Transfer block set-up.



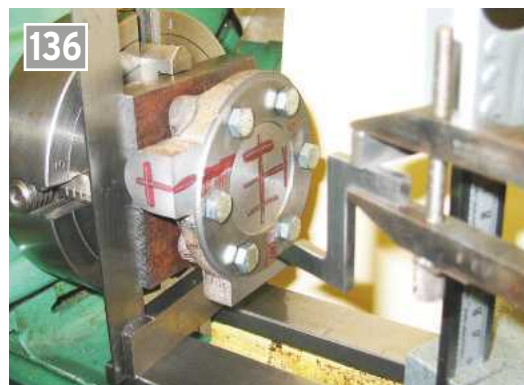
Head mounted on the transfer block.



Facing the exhaust port.



Facing the underside of the cylinder head.



Marking out for the valves and sparking plug.



Forming the exhaust valve chamber.

The cylinder head holding down studs were made from 65mm long M8 stainless bolts with the heads turned off and threaded for 0.625 inch. The studs need shortening to look right but leave this job until after the bracket has been made to hold the exhaust valve rocker. In **photo 141** can be seen the trial assembly of the cylinder with the water jacket. The groove for the O-ring was machined in the cylinder to seal the right hand end of the water jacket to the cylinder. The circular edge of the cylinder head was cleaned up on the finisher, while the rest of the casting was cleaned up with a mini drill and a rotary grindstone.

The valve guides are a straightforward turning operation machined from a 1 inch diameter cast iron bar provided in the kit. The only critical dimension is the nip for the light force fit for the valve guide into the cylinder head. The diameter of the guide was 0.0002 inch larger than the ½ inch reamed hole in the cylinder head. The ¼ inch hole for the valve was also reamed.

Valves

The valves are machined from a free cutting stainless steel. The original article specifies EN 316J stainless steel. I had an old magnetic stainless valve in my spares box, which was turned down for the exhaust valve. As I have no means of accurately measuring small holes, the stem was turned about 3 thou oversize. The machining marks were then removed. The end was parted off and the valve held by the large diameter in the three jaw chuck, and was then honed down to size. It turned out that my ¼ inch reamer reams about 0.0002 inch oversize, so as the diameter approached 0.2502 inch, the valve was found to snugly fit the valve guide.

The inlet valve was turned up from a length of non-magnetic free cutting stainless steel of unknown specification.

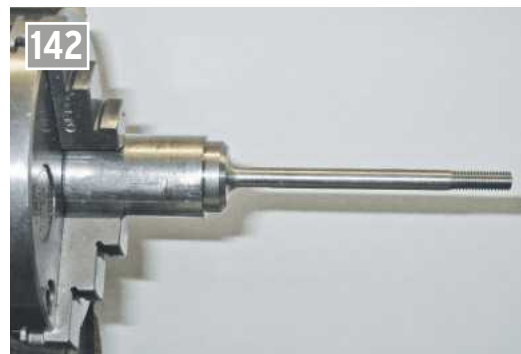
Photograph 142 shows it ready to be parted off.



Forming the 45 degree valve seats.



Drilling the inlet port prior to boring.



Inlet valve ready to part off.

The original articles are silent as to the type of valve springs, i.e., diameter, wire gauge and free length etc. so I proceeded by trial and error with springs from my spares box. The inlet valve is described as an atmospheric valve and is opened purely by the suction of the inlet stroke. The valve spring needs to be fairly light otherwise the valve won't open enough, and the valve must operate freely in its guide.

The rocker for the exhaust valve is a brass casting but the bracket to support it is a steel fabrication bolted together. As the exhaust valve location was increased by 0.070 inch from the centreline to line

up with the exhaust boss, the pivot position had to be altered outwards by the same amount. The rocker was the most difficult brass I think I have ever had to drill and tap. The drills kept binding so a succession of drill sizes were employed to achieve the tap drill size for 2BA. Normally brass is drilled dry but it was found that Shell Garia H helped somewhat. This is a

neat oil for use when turning high carbon and stainless steels. Tapping had to proceed with great caution using taper, second and plug taps in succession as I feared a tap would snap. **Photograph 143** shows my set-up for drilling and tapping the 2BA hole. Notice the clamp on the other end of the rocker to resist the drilling force.

● To be continued.



Top of the cylinder head.



Trial assembly of the cylinder head with the water jacket.



Spotting the rocker for the 2BA hole.

REFERENCE

2. *The R&B Engine*, Ron Acock recounts his experiences in building and running his R&B engine, *M.E.* 3811, October 1987, p 450, & *M.E.* 3813, December 1987, p 590.

www.machine-dro.co.uk

Fit for a Princess Royal



CLIVE
FENN

Clive Fenn designs a boiler for a 5 inch gauge LMS Pacific.

A word of warning before I commence my narrative on the construction of my Princess Royal boiler; never name your daughter after a steam engine! This I did in 1981 when my daughter, Helena Victoria was born. To the LMS devotees among you, you will know the name belonged to Pacific 6208, *Princess Helena Victoria*.

In the mid 1990s my daughter asked me if I would build her a 'Lizzie', (the nick-name for the Princess Royal Pacifics). Obviously 6208 was the one she wanted. At that time I was in the advanced stages of finishing my 5 inch gauge Princess Coronation Pacific (Duchess) engine and about to make a start on the tender for the same. This was quite convenient really, for I could duplicate all the parts, the two tenders being very similar.

Background

Work on 6208 did not start in earnest until 2008. As with my Duchess, I prefer to do my own drawings, scaling down from full size. I particularly like doing this and still work on a drawing board, ex-Rolls Royce, actually. Also I enjoy the research and gathering as much information and as many photographs as possible to get the detail correct. The year 1946 was chosen for the Lizzie, the same as my Duchess, so the two together should complement each other nicely.

The Lizzies had many boiler modifications and 6208 was no exception. The first three boilers intended for 6200, 01 and 02 were known as the Type 1 taper boiler. Designed by Jack Francis at Derby, they were a true cone and were referred to as such in LMS documents. These boilers were domeless and had the regulator valve in the wet side of the superheater header. They also did not have

a combustion chamber, only a sloping throatplate and a 45 square feet grate area. By 1937 all three boilers had been modified, gaining a separate dome and top feed, the regulator valve being then situated in the dome. Also the superheater flues had been increased in number from 16 to 32; the Great Western low degree superheat being unsuitable for conditions on the LMS. The design work for the modifications was carried out by Eric Langridge, Jack Francis, by now, having returned to Crewe.

I set to using my Black and Decker work bench, sanders and rasps outside at the top of the garden. After three days of cold but dry weather I had both inner and outer firebox forming blocks complete.

Even with the modifications, these boilers, though improved, were still shy steamers and Eric Langridge was given the task of sorting it all out. The biggest change was to redesign the firebox to incorporate a combustion chamber. The tube ratios were also juggled with, to the point where by the early 1950s there were still four different tube layouts on the Lizzie boilers. Surprisingly these new boilers had the regulator valve in the superheater header and were not all converted to domed regulators until as late as 1959. For a more comprehensive historical account I would recommend reading *LMS Locomotive Profiles No.4: The Princess Royal Pacifics* (Wild Swan Publications).

Now to the 5 inch gauge boiler for my 6208. This was to be the one carried in 1946, domeless but with a combustion chamber. Boiler building is another aspect of Model Engineering I really like.

My Duchess boiler was certainly a challenge having the correctly curved throatplate, as they were in full size. Having achieved this once I saw no reason why I could not do it again. But let's not jump ahead.

Construction order

Starting with the barrel first a cardboard template was made and checked, then laid on a piece of 1/8 inch thick copper sheet, marked out and then cut. I have no rolls of my own, so my good friend Mike Butler did this job for me. We then retired

to the local and discussed Duchesses over a couple of pints; now that's living!

Back in my own workshop I set to and made a 1/8 x 1 inch wide copper strap, slightly short at the rear to allow for the throatplate flange and at the front to allow for the smokebox. After a thorough scrub with a wire brush, a 30 minute dip in the pickle (in this case citric acid - and I was very impressed as I had not used it before) and another scrub with clean water; the strap was then riveted to the butt joint with ten 1/8 inch copper snap head rivets. After this the barrel was given another short pickle, washed, dried, fluxed and then silver soldered with HT424. My good wife, Vicki was once again on hand to help with the warm up procedure. I am pleased to report that her ladyship has not forgotten the technique of using a propane torch and kept the barrel warm on the inside whilst I tackled

Clive Fenn has kindly offered to make his boiler drawings available to readers of Model Engineer. Please contact the Editor in the first instance.

the joint on the outside with oxy-acetylene. On completion the job was pickled and given a thorough clean and inspected. Happy, I then set to in squaring the smokebox end up. Due to the firebox having a combustion chamber, the throatplate is in two halves - an upper and a lower. Consequently the barrel at this end has to be stepped in to take the upper half of the throatplate.

Before I retired I was able to get all my forming plates flame cut from $\frac{1}{2}$ inch mild steel plate. Having metal formers certainly makes light work of forming the copper plates. My next job was to form the upper half of the throatplate. This was a tricky one as it had to be bent forward to enter the barrel and rearwards to go under the outer firebox wrapper. The former was in three parts: 1) to the shape of the outer wrapper less $\frac{1}{8}$ inch all round; 2) a half circle to the measurement of the barrel and 3) a full circle less $\frac{1}{8}$ inch flange thickness (**photo 1**). I then cut a piece of $\frac{1}{8}$ inch copper plate to just over the centreline of the barrel diameter, allowing enough material to form the rear flange. This was duly annealed and I worked on this flange first. It took about three annealings before I was happy. Next I marked out a circle which, when the surplus metal was removed, would give me enough to form the forward flange. Again three annealings did the job (**photo 2**).

Next came the smokebox and combustion chamber tube plates, firebox backhead and finally the firebox backplate; all straightforward operations.



Upper throatplate formers and upper throatplate.



Upper throatplate.

The two holes were now cut out for the firehole in both firebox plates but I left the backhead hole slightly under size in order to accommodate minor errors in positioning later. The firehole ring was made from $\frac{5}{32}$ inch copper sheet, $\frac{3}{4}$ inch wide and the joint Sifbronzed. I now made a second ring from $\frac{1}{16}$ inch plate, $\frac{7}{16}$ inch wide, wrapped it around the centre of the first ring and silver soldered. This was to act as a strengthener to the butt joint. Happy so far I now held the ring in the three jaw chuck and turned down both sides to form a $\frac{3}{8}$ inch wide step in the centre. The ring was then squeezed oval to give the full size look. This was then silver soldered into the firebox backplate.

Firebox

My next task was to form the inner and outer firebox wrappers and the two curved throatplates. Before I could do this, however, I needed to make the two firebox forming blocks. These were made from $\frac{5}{8}$ inch

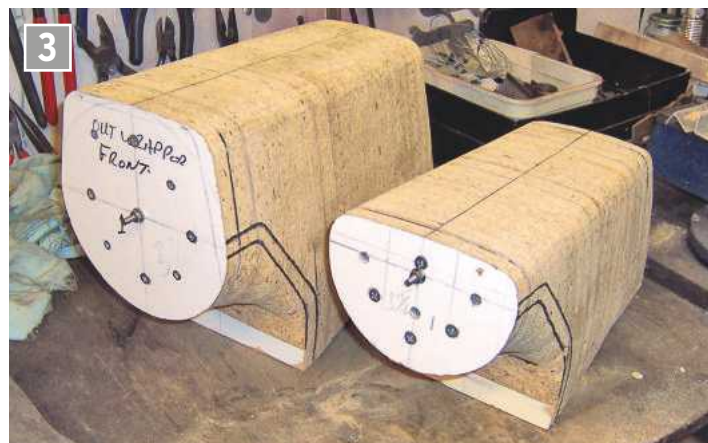
thick chipboard, of which I have a good quantity. My Grandfather used to say 'never throw anything away, you do not know when you might need it', and this applied to the chipboard. When my son was a small boy I built him a bunk-bed with store cabinet underneath for his toys etc. all out of said chipboard. So when at last he flew the nest it was disassembled and stored away on Grandad's advice - my Grandad, that is.

Making a start on the outer firebox former first, the front piece that joins the barrel was cut out using a jigsaw, then the piece which forms the beginning of the front of the foundation ring and, lastly, the backhead, all to the correct shape and size less $\frac{1}{8}$ inch, being the thickness of the wrapper. Now more panels were cut slightly oversize to go between. The outer firebox being just short of 12 inches long required something like 19 panels. A $\frac{3}{16}$ inch mild steel bar went through the whole lot exactly on the boiler centreline,

each panel being held together with the next one with $1\frac{1}{2}$ inch and 3 inch wood screws. The inner firebox former was now assembled in the same way.

There is nothing worse than dust so on a cold February day, with a north easterly blowing, I set to using my Black and Decker work bench, sanders and rasps outside at the top of the garden. After three days of cold but dry weather I had both inner and outer firebox forming blocks complete (**photo 3**).

Using the forming blocks I now made two cardboard templates for the inner and outer firebox wrappers. These were then placed on $\frac{1}{8}$ inch copper sheet and cut out. A datum line was then lightly scribed down the centre of the crown of both wrappers they were annealed. Taking the outer wrapper first, it was centred on the block and held in place by a large clamp (**photo 4**) and bent to shape. The nice thing about wide fireboxes is that they only have the two top corners to bend, so four warm-ups each did the job.



Firebox forming blocks.



Outer firebox former and clamp.



Starting to form the inner throatplate.



The inner throatplate takes shape.



Starting to form the outer throatplate.

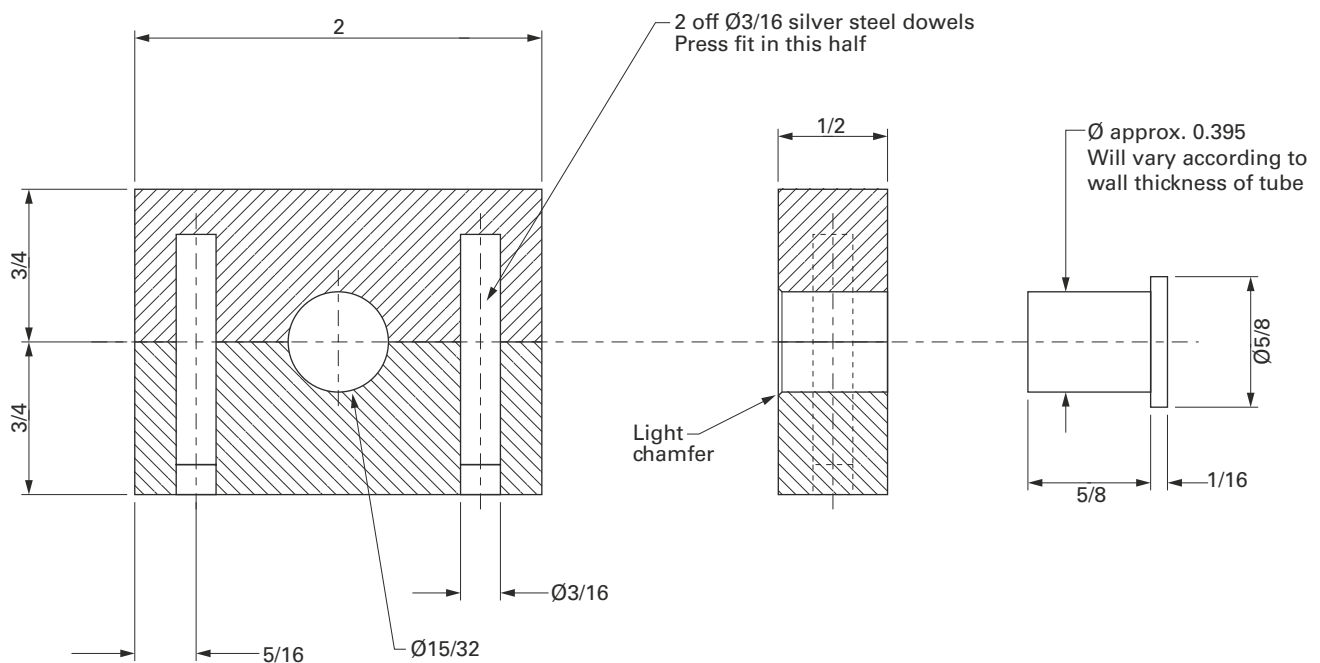


The outer took about 12 hours' work.

Next came the challenge; the forming of the two throatplates. The outer one was attacked first and believe it or not, took two days to achieve - about twelve hours all told. Obviously, several annealings and a lot of patience are required. At first you think it is never going to go but eventually it does and you are home and dry. The inner one took slightly longer owing to the tighter radii. **Photographs 5, 6, 7 and 8** show the process. Some may think this was a lot of hard work when a flat throatplate would have done but, to me, the full size ones had a curved throatplate so mine had to have one to. What I have achieved, by means of a model, was what Crewe boiler shop achieved after Eric Langridge had explained what he wanted.

Tubes

Swaging the tube ends that go into the firebox tubeplate was next. Swaging was something that was done on full size



Swaging Tool
MAT'L: Mild steel

Fig 1

locomotives; it is simply a slight reduction in diameter of the tube at the firebox end. I reduce the diameter of my tubes by $\frac{1}{32}$ inch. This not only prevents the tube from slipping through the tubeplate whilst brazing, but also I believe strengthens it. As opposed to turning a few thou off, which to my mind would weaken it. The drawing for a swaging tool is shown in **fig 1**. The procedure is to anneal one end of the tube, place it in the tool and squeeze it down using the vice jaws, not forgetting to place a suitably sized reduced piece of bar inside the tube. I generally squeeze once then turn the tube 90 degrees and squeeze again. The ends of the tubes are then dressed in the lathe to the correct length giving about $\frac{1}{16}$ inch protruding into the firebox.

Drilling and boring the holes in the two tubeplates was next. A simple enough job but time consuming (**photos 9 and 10**).

After this, all the various bushes in a combination of gunmetal and phosphor-bronze were produced for all the fittings. These were not fully tapped out at this stage. This would be done when all brazing operations had been carried out. Blind bushes for the traverse stays - 22 in total - were machined from gunmetal, the stays being of $\frac{1}{4}$ inch diameter copper rod. Side stays were 1 x $\frac{3}{16}$ inch copper snap head rivets. Crown stays, 72 in all, were made from $\frac{3}{16}$ inch phosphor-bronze rod. Mike Butler gave me a good tip here: hit the end of the stay about $\frac{3}{16}$ inch down with a chisel. This forms a lip so that when the stay is



Drilling and...



...boring the tubeplates.



Forming a lip on the stay.



The jig and a crown stay.

in place it will not drop through whilst the brazing operation is being carried out (**photo 11**). **Photograph 12** shows the jig and the crown stay.

Assembly

The materials up to this point had cost just over £600. It was now time to start the interesting bit of sticking together all the above parts. So, to resume from the barrel strap joint, the next stage was the attaching of the outer firebox wrapper, and throatplate, to the barrel but first I had to get things lined up. The only flat surface large enough

was the kitchen work surface so, choosing a day when Her Ladyship had gone out, I began to play. Firstly, I placed a large piece of wall backing paper on my drawing board and drew out an outline drawing of the boiler as if being viewed from above. This drawing was then placed on the kitchen work surface and the boiler place on top, and lined up. At this stage the barrel was not physically attached to the outer wrapper/ upper throatplate assembly. Checking with a set square, all seemed well so a $\frac{1}{8}$ inch hole was drilled through the top of the barrel and upper

throatplate on the centreline and a 5BA nut and bolt put through to hold it in place. Next the whole assembly was laid on its back and the necessary packing pieces placed under the front of the barrel and rear of the firebox. This was to give the correct amount of slope to the front and rear from the top of the upper throatplate. Checking all was square, the lower throatplate was placed in position and clamped whilst three $\frac{1}{8}$ inch holes were drilled and the necessary 5BA nuts and bolts put into position to hold everything in place (**photos 13** ➤



Lining up the barrel to firebox.



Choose a day when you are on your own in the kitchen!



Lower throatplate to barrel joint.



Inner firebox and tubeplate assembled.



Inner and outer fireboxes drilled for stays.



The jig in preparation for assembly.

and **14**). These nuts and bolts were later changed to copper rivets with 5BA brass nuts placed on the outside, the brass nuts being filed off after brazing. Satisfied all was well everything was taken apart, scrubbed with a wire brush, pickled and cleaned and put back together. All the joints were then fluxed with HT5. The boiler was placed upright on the brazing hearth and warming up began.

The first joint to be tackled was the upper, then the lower throatplate to barrel. The upper was difficult to get to and I should perhaps have done it as a separate operation but I persevered. During this operation Vicki was working the propane on the outside of the barrel, whilst I worked from the inside of the firebox with the

oxy-acetylene. We then reversed rolls and I brazed up the outer joints, all being done with high melting point silver-solder 424. The whole was left to cool, pickled, cleaned and inspected (**photo 15**). Happy, the next job was the firebox tubeplate to the inner firebox wrapper and throatplate. This again being done with 424 silver-solder (**photo 16**).

I now came to placing the inner firebox inside the outer one and checking clearances. I needed a distance of $2\frac{1}{16}$ inches between crowns so the necessary packing was put in and some $\frac{3}{8}$ inch square packing where the foundation ring would be. The boiler was then checked. All being well so far, three pieces of $\frac{3}{8}$ inch square copper foundation ring

were made, one for the front and two for the sides. These were held in place with 5BA bolts, two to each section.

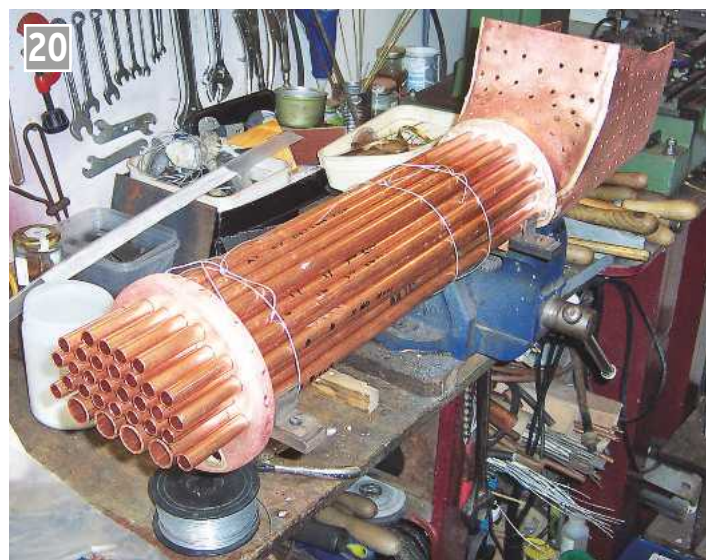
Next came the drilling for the stays. Firstly, I marked out the outer wrapper and drilled through with a $\frac{1}{8}$ inch drill where the four corner stays would be, on both sides and the crown. I did not go through the inner firebox, only touched it enough to show a mark. A similar procedure was adopted for the throatplate. The two fireboxes were now separated, checked and the inner one marked out from the drill marks. When satisfied, all holes were drilled through both inner and outer fireboxes separately with a $\frac{1}{8}$ inch drill. Doing it this way ensures the stays are all at the correct

pitch. The two fireboxes were then reassembled and all holes run through with a $\frac{3}{16}$ inch drill (**photo 17**). By this time the firebox backplate and backhead had been fitted temporarily. All stays were now temporarily put in place and checked.

It was now time to cut the tubes to length. The smokebox tubeplate was put into position, but not soldered. Each tube was now put through the smokebox tubeplate and fed into the firebox tubeplate, measured, cut and numbered. To solder the tubes in I needed a jig (**photo 18**) to keep everything square. This is a simple piece using a length of $1 \times 1 \times \frac{1}{8}$ inch steel angle. Three cross pieces are fixed on to the angle to align the tubes to the firebox and keep everything in line and



Assembling in the tubes.



The tubes in place and held with wire.

square. On the Lizzie boilers the fireboxes slope from front to back so this had to be taken into account and the necessary packing piece put in under the rear of the firebox. The tubes and firebox was now cleaned in the usual way, positioned square on the jig, the firebox being secured using two of the crown stay holes. Each tube was then placed in position in relation to their number, fluxed, and attached with a ring of silver-solder (**photo 19**).

Photograph 20 shows the tubes in place and held with wire and **photo 21** shows the tubes soldered in, viewed from inside the firebox. The whole tube/firebox assembly was now cleaned, checked and replaced back into the boiler. It was satisfying to find that the tubes were less than half a tube out of line vertically, and spot on horizontally when the smokebox tubeplate was replaced so very little adjustment was required.

Stays

The stays were the next job and the most difficult exercise was to be the silver-soldering of the stays on the inside of the throatplate, owing to the curved throatplate and combustion chamber. Copper snap head rivets, 1 x $\frac{3}{16}$ inch were used for this job. The boiler was now placed in the pickle and thoroughly cleaned, together with the stays. Before each stay was placed in position and fluxed using Easyflo paste,



The tubes soldered in, viewed from inside the firebox.



Firebox tubeplate and crown stays.

the tubeplate baffle was put into position up against the tubes. The baffle is no more than a simple piece of $\frac{3}{16}$ inch thick mild steel plate, cut to the shape of the inside of the firebox tubeplate and held in position with a suitable length of threaded bar - going down one of the centre tubes - and a nut and washer placed loosely on each end (**photo 22**). Between the plate and the tubes I placed some insulation material. Oxy-acetylene is a must here, as you need to get right inside the firebox. With the boiler in



The baffle.

its working position and the firebox overhanging the brazing hearth, and using Easyflo 455, warming up proceeded, my wife warming the outside of the throatplate using propane with a 2943 nozzle, whilst I warmed up the inside. Having finished the above procedure all was cleaned and checked. Now the boiler was placed on its back and the outside of the throatplate stays silver-soldered. Owing to the bottom row just above the foundation ring being horizontal I left these out with the intention of coming back to them when

I soldered in the inside of the firebox backplate stays. They would be vertical then and a good joint would be ensured.

A start on the crown stays was next. A lot of concentration was needed here as there are 72 of these and I did not want to miss any out. With the boiler on its back again, the outside was warmed up using the propane whilst I concentrated on the inside working from front to back. After a good pickle and clean all was checked (**photo 23**); full marks - I had not missed any!

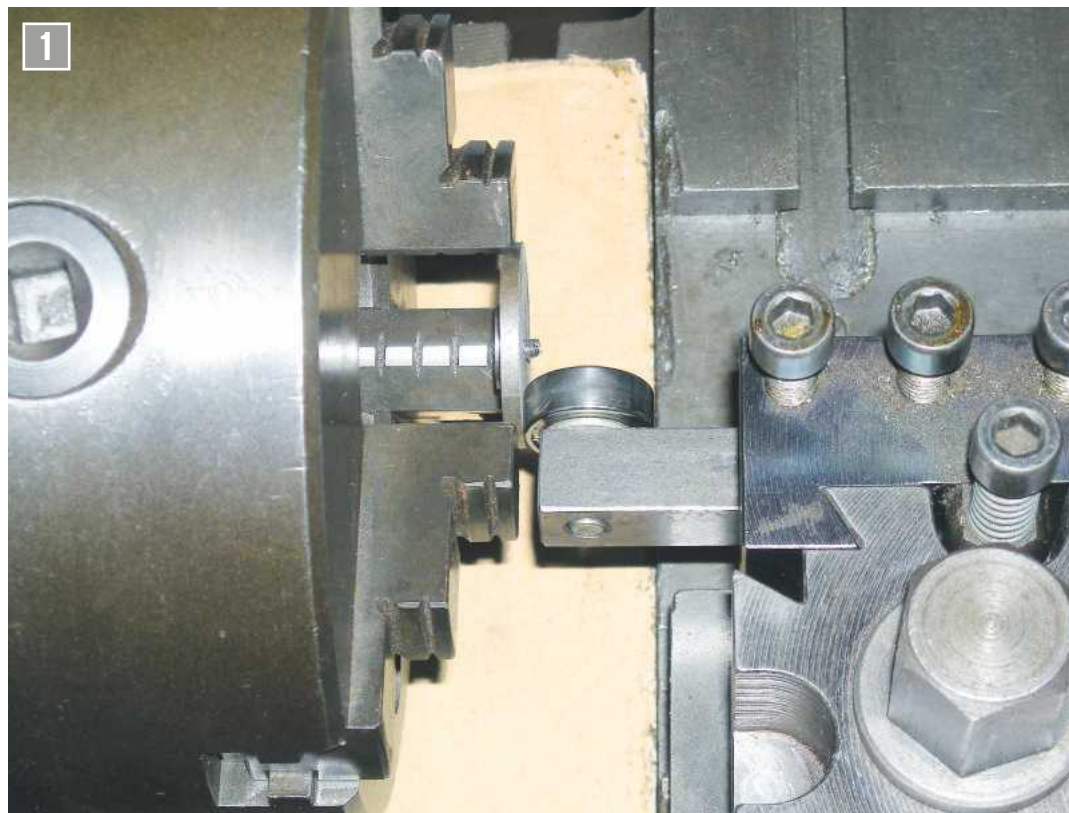
● To be continued.

A Truing Roller

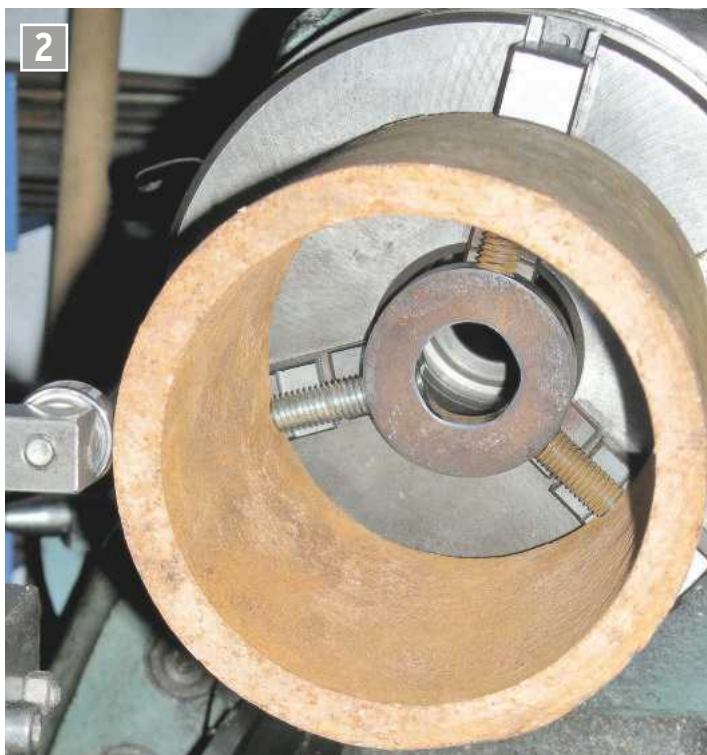


JACQUES
MAUREL

Jacques Maurel
nudges things along.



The truing roller in use.



The tool in use on a larger job.

This tool is very useful for truing parts held in a lathe chuck.

Photograph 1 shows the tool's main use which is to eliminate the wobble of a thin part. This part must be tightened lightly in the chuck and the roller pressed slowly onto the part which would be

running slowly at about 200 rpm, until the wobble is taken out (or only a few hundredths of a millimetre are remaining). The lathe is then stopped and the chuck tightened correctly before machining. For best results the roller axis must be adjusted onto centre height to minimise slipping.



Truing a ring.



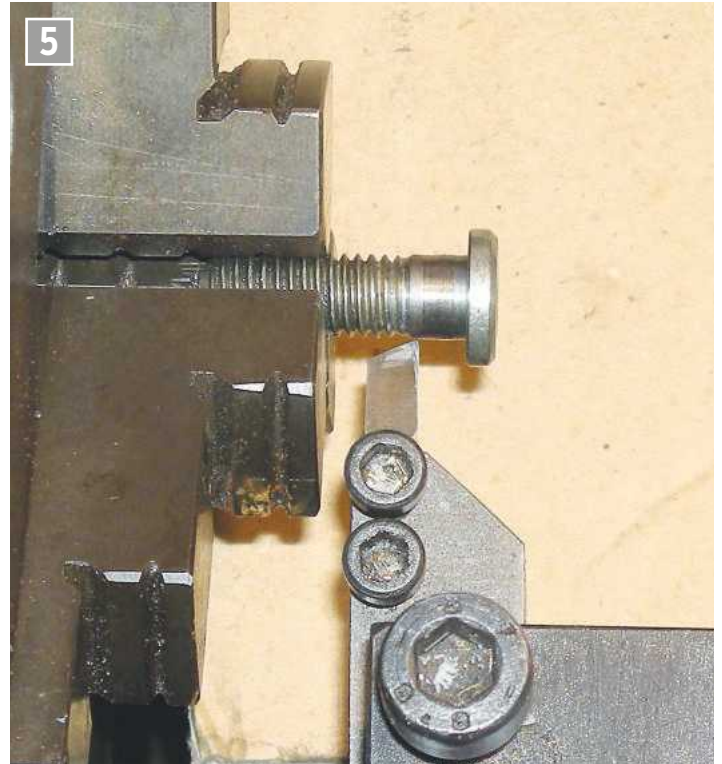
Components of the tool.

This small tool works well with a standard ball bearing whereas those having a thinner outer race are not intended for this type of work.

Photograph 2 shows the tool being used to eliminate the run-out of a piece of large diameter tubing. Turn the chuck by hand, move the cross slide slowly and be careful not to over-do it as the part may 'crawl' out of the chuck. A 'star' made from a thick ring and three pieces of threaded screwed rod is located in the centre of the tube; simply turning the threaded rods with your fingers until in contact with the bore, avoids distorting the tubing when the chuck is tightened. **Photograph 3** shows a special set-up; a batch of rings have been machined by an inexperienced turner; they had acquired a 'triangular' shape due pressure from the chuck jaws as no 'star' had been used. The jig is made of a large washer used as a faceplate (held in the chuck) and the three clamps are acting axially. It was therefore possible to true the ring and to lock it with no distortion before machining.

To make this useful tool you will need a sealed ball bearing (**fig 1**: part 3: 8mm ID, 22mm OD, width 7mm), a standard M8 x 20 socket screw (part 4), a standard 8mm washer (part 2) and 100mm of 16mm square

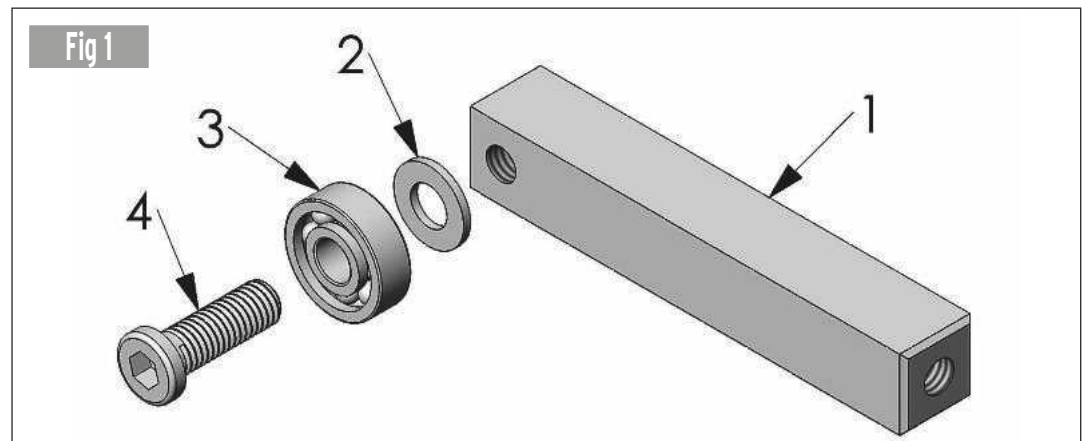
CRS (part 1). **Photograph 4** shows all the components. The head of the socket screw must be machined with a thin left hand tool to make the ball bearing seating (**photo 5**).



Machining down the head to accommodate the bearing.

Remember that the ball bearing is small so don't exert high forces on it (don't use it for swaging works!). This small tool works well with a standard ball bearing whereas those having a thinner outer race

are not intended for this type of work; special ball or needle bearings, with a thicker outer race that are used as 'cam followers' and would be better in this application, are available but are more expensive. **ME**



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Bantam Cock

A 2-6-2, L.N.E.R. V4 - 3½ inch gauge engine

LBSC
continues his
V4 locomotive.

PART 25

*Continued from page 47
(M.E. 4497, 12 December 2014)*



Before making the injector there are two little jobs to be done. The first is to line up the blast nozzle with the chimney. Get a piece of straight rod (I use a length of silver steel) which will exactly fit the blast-pipe nozzle without shake, and put it down the chimney into the nozzle. The part projecting above the chimney should be exactly central with same; if it inclines to one side, very carefully bend the blast-pipe until the rod is central. You are then certain that the jet of exhaust steam will fill the liner correctly and create maximum draught.

Item No. 2 is a means for retaining the drop grate in the horizontal position when the engine is working. Right in the middle of the backhead, opposite the central firebar, and just below it, drill a No. 21 hole through the foundation ring, keeping as far below the water space as possible. Cut a piece of silver-steel rod $\frac{5}{32}$ in. diameter and about an inch long, round off one end, and screw the other $\frac{5}{32}$ in. by 40. Turn up a 'button from $\frac{1}{2}$

in. rod, any metal; screw it on to the pin, and knurl it with a coarse-cut file, same as a valve wheel. Push up the drop part of the grate with a piece of wire - the fireman's pricker does this job when the engine is complete and running - insert the pin (as shown in the assembly sketch in an earlier instalment) and let the grate drop and rest on it. When the engine has finished a run, pulling out the pin allows the grate to drop and discharge all the residue through the open back of the ashpan.

Injector

Before starting to connect up the feed pipes, we had better make the injector; then the whole of the pipe work can be done right away. Judging from my correspondence, most builders of small locomotives seem scared of tackling the making of an injector, but it is merely a question of 'knowing how.' An injector suitable for *Bantam Cock* is a simple little gadget, as you will see from the following notes; once made and installed, all you have to do is

to keep it clean, and it will feed the boiler without any trouble. As to reliability, some of my own engines have no pump at all, and rely entirely on injector feed; so far, none of them has ever been short of water.

Injectors are now universally used on full-sized locomotives; the only engines having pumps, are those with separate feed-water heaters, which render the feed too hot for injector working. I might add here, for the benefit of beginners, that the action of an injector is simply that the jet of steam, issuing from the steam cone, meets a stream of water and condenses in it, imparting its speed to the water, which rushes out of the second cone with sufficient force to bump up the clack valve and enter the boiler. If the steam cannot condense, due to the feed water being too hot, the injector will not work.

No castings are needed for the injector, the body being built up from two bits of brass silver-soldered together. Chuck a piece of $\frac{5}{16}$ in. square brass rod truly in the four-jaw; any grade of brass will do, even screwed rod; there are no moving parts



Castings for Bantam Cock are available from Reeves 2000, Appleby Hill, Austrey, Warks CV9 3ER
T. 01827 830894
E. sales@ajreeves.com
W. <http://www.ajreeves.com>

in the injector, and nothing to wear out. Face the end, centre, and drill down about 1 in. depth with No. 23 drill. Turn down $\frac{5}{32}$ in. of the end to $\frac{1}{4}$ in. diameter, and screw in $\frac{1}{4}$ in. by 40. Part off $\frac{7}{8}$ in. from the end. Reverse in chuck, and see that the hole in the centre of the piece of metal runs truly; I usually slack No. 1 and 2 jaws of the chuck, and tighten the same two when replacing the bit of metal, which does the trick. Repeat the turning and screwing operation mentioned directly above, then poke a $\frac{5}{32}$ in. parallel reamer right through. You now have a piece of $\frac{5}{16}$ in. square, $\frac{9}{16}$ in. long, with $\frac{5}{32}$ in. of thread at either end. Check off, as the overall length is important, the correct adjustment of the cones depending on it.

Draw a line down the centre of one of the facets, and make a centre dot $\frac{1}{8}$ in. from each shoulder; that is, $\frac{5}{16}$ in. apart. Drill them out with a No. 40 drill, one going clean through the piece, and the other just penetrating the centre passage. Open out this last one with an $\frac{1}{16}$ in. or No. 18 drill. Open out the bottom half of the first one, as far as the passageway, with a No. 30 drill, tapping it $\frac{5}{32}$ in. by 40. On the facet directly opposite, make a centre-pop dead in the middle, and drill into the central passageway with a $\frac{1}{8}$ in. or No. 32 drill. Run the $\frac{5}{32}$ in. reamer through again, to clean off any burrs, and fit a $\frac{1}{4}$ in. by 40 nipple in the $\frac{1}{16}$ in. hole, as described for the boiler fittings.

Chuck a piece of $\frac{1}{2}$ in. round, brass rod in the three-jaw, face the end, and part off at $\frac{5}{16}$ in. length. The tool-marks will show the true centre of this piece; so scribe a line across it, cutting through the centre, and on that line, at $\frac{1}{16}$ in. from the centre, make a centre-pop. Chuck the piece in the four-jaw with the centre-pop running truly; drill right through with a No. 34 drill, open out to about $\frac{3}{16}$ in. depth with $\frac{7}{32}$ in. drill, bottom to $\frac{1}{4}$ in. depth with $\frac{7}{32}$ in. D-bit, slightly chamfer the end of the hole, tap $\frac{1}{4}$ in. by 40, taking care not to let the tap damage the D-bitted seating, and skim off any burring. Put a $\frac{1}{8}$ in. parallel

reamer through the remnant of the 34 drill hole. The next bit must be done carefully. Turn the piece over and at $\frac{1}{8}$ in. from the edge farthest away from the $\frac{1}{8}$ in. reamed hole, make another centre-pop. Drill this out diagonally, so that it breaks into the tapped part of the other hole about $\frac{1}{8}$ in. from the top; see sectional illustration.

The two pieces now have to be silver-soldered together. Mix up a little powdered Easyflo flux, to a creamy paste with a few drops of water and smear the parts to be joined, also putting some around the nipple; then place them together so that the $\frac{1}{8}$ in. reamed hole in the circular section comes over the $\frac{1}{8}$ in. hole in the middle of the square section. The end of the diagonal

hole should coincide with the No. 40 plain hole, as shown. Tie the parts together with a few strands of iron binding wire such as used for making up bunches of flowers. Put the assembly in your brazing pan, carefully bring it to a dull red and apply a touch of best grade, silver-solder or Easyflo if you can get it. This will melt, run around the nipple, and penetrate clean through the joint. When it cools to black, drop in the pickle-bath to quench out; then wash off, remove the wire, clean up and file away the superfluous metal at each side, leaving the top looking oval in plan, as shown.

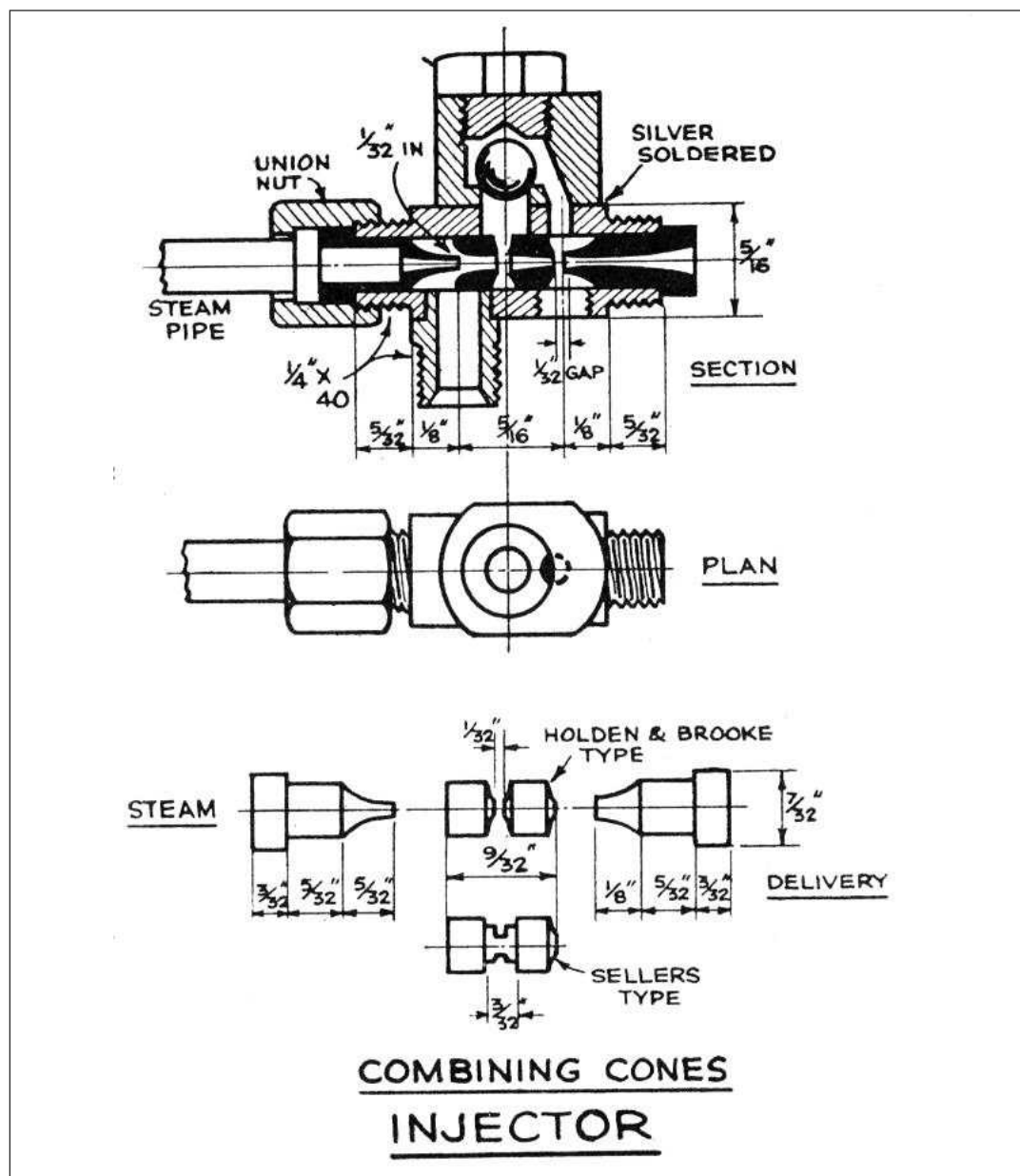
Drop a $\frac{5}{32}$ in. rustless steel ball in the hole, and seat it with a hammer and bit of brass, as described for the boiler feed

pump; then take the depth from top of hole to ball, and turn up a little cap from a bit of $\frac{5}{16}$ in. brass rod; the screwed part being the same length as the depth indicated by the gauge. Before parting off the cap from the rod, make a countersink with a $\frac{3}{16}$ in. drill, about $\frac{1}{16}$ in. deep; see section.

After parting off, reverse the cap in chuck, and chamfer the hexagon. As the ball chamber is open to the atmosphere via the diagonal hole, the cap need only be screwed in finger-tight, and no jointing material is needed on the threads.

Cone reamers

As the cones have tapered holes in them, it will be necessary to make some



reamers of the required taper; a job which is quite simple, and taking very little time.

Chuck a piece of $\frac{5}{32}$ in. round silver-steel about $2\frac{1}{2}$ in. long, and turn a cone point on it $1\frac{3}{16}$ in. long; if your top slide has a graduated scale, you will find that setting it over to about $4\frac{1}{2}$ degrees will do it. Chuck another similar piece, and turn another cone point $1\frac{1}{16}$ in. long; set over to about $3\frac{1}{2}$ degrees. If your slide rest has no graduations, the only thing to do is get the lengths by trial and error. Chuck a third piece of steel, and turn a cone on it $\frac{5}{32}$ in. long, then radius it out as shown; the exact curve does not matter, as it is only used to form the bell-mouths of the combining and delivery cones, but it should be gradual as shown. File the turned part of all three pieces to the centre-line (see illustration); then harden and temper them to dark yellow. For beginners' benefit, here is a brief resume of the way to do the job. Heat each to medium red, and plunge vertically into clean cold water. Brighten the flat part by rubbing on a piece of fine emery cloth, but don't destroy the sharp edges – very important that! I usually touch mine on a fast-running emery wheel. Now lay each separately on a piece of sheet iron, and hold it over a gas or spirit flame with a small pair of tongs. Watch the brightened part, and as soon as it turns yellow, tip the reamer into clean cold water. Finally, rub the flat on an oilstone to smooth the cutting edges, and the reamers are ready for use.

How to make the cones

The combining cone (centre one) is made and fitted first, as the other two can be adjusted to it. Chuck a piece of 6 in. round brass rod in the three-jaw, and turn about $\frac{1}{2}$ in. of it to a very tight drive fit in the reamed hole through the injector body. Beginners should first turn the end of the rod for about $\frac{1}{8}$ in. length, until it will push in the hole very tightly; then turn the cross-slide handle back about half a turn, bringing it forward again almost to its original position, but not quite. If the

the drill to seize up; to avoid this, all you need do is to work the drill in and out like a piston-rod working in a cylinder. This allows all the chippings to fall clear, and you can put a No. 80 drill, if necessary, down to the full depth of the flutes without breakage. High speed is needed; I usually run a No. 70 at about 4,000 r.p.m.

Reverse the cone in the chuck, and try the end of the reamer with $\frac{3}{16}$ in. taper, in the hole, noting how far it goes in; then put it in the tailstock chuck, and with the lathe running fast,

in to the nipple end of the body, and squeeze it flush, with a piece of soft copper between vice jaws and injector to prevent damage; then put a piece of brass rod a little less than $\frac{5}{32}$ in. in diameter, between cone and vice jaw, and squeeze the half-cone in, until the end is about $\frac{1}{64}$ in. past the centre of the ball-seat hole. The cap and ball should, of course, be removed whilst pressing in the cone. Then repeat the performance with the second half of the cone pressing in until the halves are $\frac{1}{32}$ in. apart under the ball seat. If the reamer is then tried in the taper hole, it should seat in both halves of the cone without shake.

To make the Sellers type cone, chuck in three-jaw, and instead of sawing it in two, form a groove in the middle a little under $\frac{1}{16}$ in. deep, with a parting tool $\frac{3}{32}$ in. wide. Then with a thin flat file such as watchmakers use, file two slots about $\frac{1}{32}$ in. wide, in the middle of the groove at opposite sides, cutting into the central passage; (see illustration). Run the taper reamer in again, to remove any burring; then press the cone into the injector body, from the nipple end, as described above, so that the groove comes below the ball seat.

Steam cone

Chuck a piece of $\frac{7}{32}$ in. brass rod in the three-jaw; face the end, centre it, and drill down about $\frac{1}{4}$ in. in depth, first with a 65 drill, and then with a 63, to get correct size hole. Put the reamer with the $1\frac{3}{64}$ in. of taper in the tailstock chuck and slightly broach the hole with it; if you enter the point of the reamer to a depth of $\frac{5}{32}$ in. it will be just right. Now turn $\frac{5}{16}$ in. length to a fairly tight push fit in the injector body; just tight enough to get in and out with your fingers. The outer end is then turned to the shape shown; Note, the curve is most important, because if the nose is too blunt and too thick, the injector will not work. The length of the shaped part is $\frac{5}{32}$ in., and the extreme tip should be almost parallel as shown, being turned down practically to a knife edge around the broached hole. Part

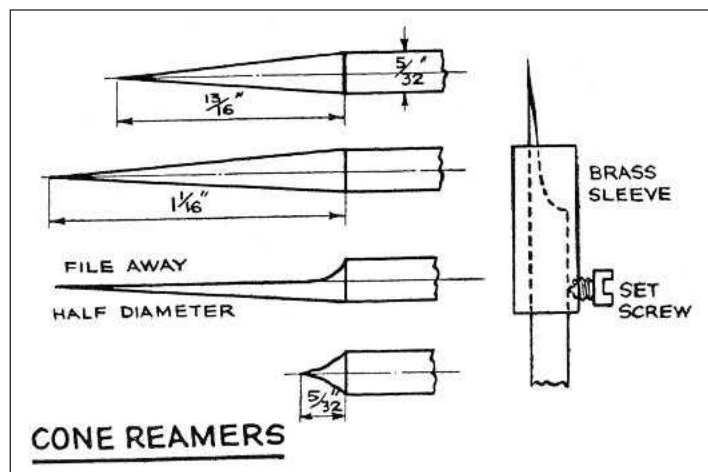
Most builders of small locomotives seem
scared of tackling the making of an injector,
but it is merely a question of 'knowing how.'

cross-slide has a 'mike' collar, about half a division short of the original reading will be about right. With this setting, turn the half inch mentioned above, and turn away the $\frac{1}{8}$ in. undersized bit. With a very small centre-drill held in the tailstock chuck, make a centre in the end of the rod; then drill it for about $\frac{3}{8}$ in. depth, first with a No. 72 drill, then with a No. 70, so as to get the hole exactly the right size. Form a slightly blunt nose on the end, as shown in the illustration, and part off at $\frac{9}{32}$ in. from the end. Don't be scared of drilling the weeny hole for fear of breaking the drill in it. The cause of a drill breaking in a hole is usually the flutes becoming choked with chippings causing

ream the hole in the cone until the point comes through a shade less than it went in at the other end. I use a stop on all my reamers; simply a piece of brass rod, drilled No. 21 and furnished with a set-screw - see the illustration. If this is slid over the reamer to the length of the cone plus the required projection, and the setscrew tightened, you cannot push the reamer through too far, and spoil the size of the exit hole. Test with a No. 69 drill; if that goes through, the hole is too big. Slightly radius the end of the hole.

Cones

The combining cone may either be completely divided, as in the full-size Holden and Brooke injectors, or slotted like the American injectors of Sellers make. For the former, hold the cone, nose outwards, in the three-jaw, with a little over one-half projecting; saw off the piece with a jeweller's hacksaw close to the jaws, then face the end with a knife tool, cutting back slightly as shown. Put the other piece in the chuck, sawn side out; face that also, and very slightly radius the hole, with the short nosed radiusing reamer. The two parts of the cone are then squeezed into the injector body, using the vice as a press. Centre the nose end of the cone



off to leave a shoulder $\frac{3}{32}$ in. wide; reverse in chuck; centre, and drill down $\frac{1}{2}$ in. depth with No. 30 drill. This will leave a taper at the end corresponding to the drill point, and it may be slightly 'streamlined' by judicious application of the reamer used for broaching. Be careful not to overdo it and enlarge the throat of the No. 63 hole, or you will destroy the ability of the injector to work at the higher pressures. Skim off any burr left by the drill, and the cone is complete.

Delivery cone

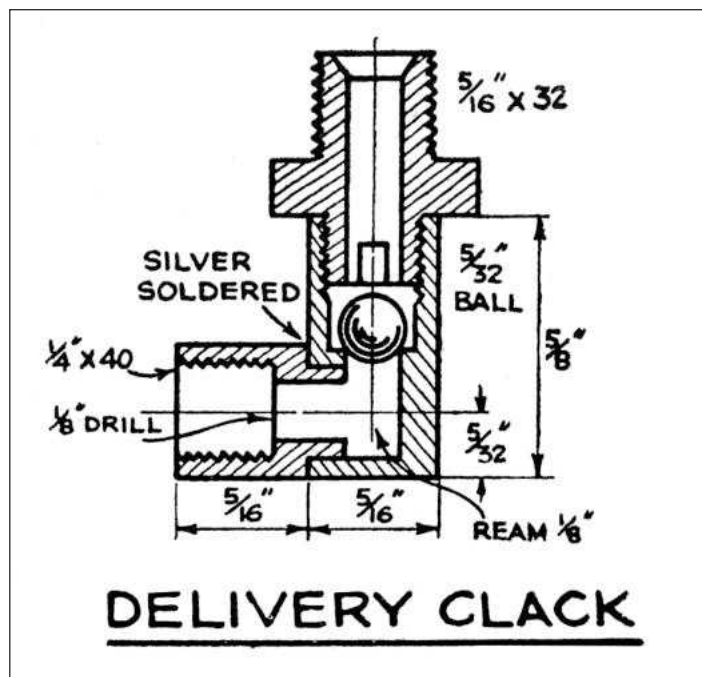
This one requires a little more care as a smaller size drill is needed. Chuck the $\frac{7}{32}$ in. rod again, face the end, centre, and drill down about $\frac{5}{16}$ in. depth, first with a 77 drill, and then with a 75. Incidentally, for centring before using these small drills, I use a homemade centre-drill, as the commercial variety makes too big a hole. Mine is simply a broken stub of a dental burr, ground to a weeny arrow point; but anybody can make one from an inch or so of $\frac{1}{8}$ in. silver steel, if they turn an ordinary round cone point on the end, then form the end into an arrow point by rubbing flats each side, on a fine oilstone, and hardening and tempering to a dark yellow. Next, with the very short reamer, bell-mouth the hole to a diameter of $\frac{3}{32}$ in.; then turn down the piece for a length of $\frac{1}{32}$ in. to a tight push fit in the injector body, as before, further reducing $\frac{1}{8}$ in. of the end to the shape shown. Part off to leave a flange $\frac{3}{32}$ in. wide behind the shoulder; reverse in chuck, centre, and drill down with the No. 70 drill until you meet the 75 hole drilled from the other end. Put the reamer with $1\frac{1}{16}$ in. taper in the tailstock chuck, and carefully ream out the hole until the point just shows at the bottom of the bell mouth; it is best to take the cone out of the chuck when checking. Finally, slightly bell-mouth the flange end with the short reamer, and skim off any burr. The diameter of the throat should be tested by trying to push a 74 drill through it; this should not pass, but a 75 should pass easily. If you have been unlucky, and the 74 does pass, don't worry, the cone can

be used. Drill both steam and combining cone one size larger, so that the combination is 62-69-74 instead of 63-70-75. The injector will work over the same range of pressures, but it will feed a little faster, and probably reduce the steam pressure a few pounds when used whilst the engine is running.

When the steam and delivery cones are pushed into their respective ends of the injector, the steam cone should enter the combining cone to a depth of $\frac{1}{32}$ in., and there should be a gap of $\frac{1}{32}$ in. between the end of the delivery cone and the nozzle of the combining cone, as shown in the sectional illustration.

Most full-size injectors have a delivery clack self-contained in the body casting, but ours is too wee for that, so we have to make a separate delivery clack and screw it on to the delivery end of the injector. Chuck a piece of $\frac{5}{16}$ in. round brass rod in the three-jaw, face the end, centre, drill down $\frac{5}{16}$ in. depth with a No. 33 drill, open out with $\frac{7}{32}$ in. drill to about $\frac{1}{4}$ in. depth, and bottom the hole to $\frac{5}{16}$ in. depth with a $\frac{7}{32}$ in. D-bit. Poke a $\frac{1}{8}$ in. reamer into the remains of the No. 33 hole, and tap the upper part $\frac{1}{4}$ in. by 40, taking care not to let the tap spoil the D-bitted seating.

Slightly countersink the end, and part off to a length of $\frac{5}{8}$ in. At $\frac{5}{16}$ in. from the blind end, drill a $\frac{3}{16}$ in. hole into the central passageway. Chuck the $\frac{5}{16}$ in. rod again; face, centre, and drill down to $\frac{1}{2}$ in. depth with $\frac{1}{8}$ in. drill. Open out with $\frac{7}{32}$ in. drill, and bottom with $\frac{7}{32}$ in. D-bit to $\frac{1}{4}$ in. depth; tap $\frac{1}{4}$ in. by 40. Part off at $\frac{7}{16}$ in. from the end, reverse in chuck, and turn a pip about $\frac{3}{32}$ in. long on the other end, to a tight press fit in the hole in the side of the other piece. Press it in, and silver-solder it; pickle, wash and clean up. Seat $\frac{5}{32}$ in. ball on the hole in the vertical part, and make a cap to fit, same as described for the top of the boiler feed pump. The ball should have a good $\frac{1}{32}$ in. lift, and the nicks should be large enough to let the water pass easily. The complete assembly is shown in the sectional illustration, and the whole gadget is screwed on



the end of the injector body over the flange of the delivery cone. It should stand vertical when right home; if it does not take a tiny skim off the back of the delivery cone, and try again, until it does. The injector is then complete. This size and type, by the way, is suitable for any locomotive of 2½ in. or 3½ in. gauge. It takes about 2½ minutes to feed in a pint of water, at any pressure from 80 lbs. down to almost nothing, and does not use enough steam to worry any 2½ in. gauge boiler of my design.

Pipe connections

I always arrange the pipes under the engine drag-beam and the front of the tender, so that any engine can be used with any tender of the same gauge; and a sketch of the arrangement for an engine with one pump, and one injector is reproduced here. The pipes on a wide-firebox engine having a trailing cradle, such as Bantam Cock, are carried in two plate brackets screwed to the beam, the pipes passing through holes, but not fixed in any way. The only fixture is the union screw for the hand pump connection. The drawing explains itself; the brackets are pieces of $\frac{3}{32}$ in. brass sheet, 1¼ in. square, with $\frac{3}{16}$ in. holes drilled for the pipes in the location shown; and a $\frac{1}{4}$ in. hole for the hand pump union. They are filed to clear the angles

attaching the drag beam to the cradle, and are themselves attached by two countersunk screws and nuts, as shown in the small side view.

Like the wires in a radio set, as long as the pipes start and finish at the right places, it does not matter a great deal as to what route they take between terminal points so I have shown the pipe connections in diagram form, the same as the radio designer shows a 'schematic' diagram of his wiring. The hand pump connection can be made first, the $\frac{1}{4}$ in. by 26 union fitting being made from $\frac{5}{16}$ in. hexagon brass rod by the same process described for the top fittings of the hand and eccentric-driven pumps, one end being screwed $\frac{1}{4}$ in. by 26, and the other $\frac{1}{4}$ in. by 40. Measure the length of pipe required, from the bracket to the union on the left-hand clack, with a bit of copper wire, and cut a piece of $\frac{5}{32}$ in. copper pipe the same length. One end is silver-soldered into the $\frac{1}{4}$ in. by 40 end of the union fitting; the pipe is then put through the bracket (temporarily removed), the union also being pushed through and lock nutted, as shown in the small detail side view. A union nut and cone is put on the other end of the pipe. Put the nut on first, then the cone, and silver-solder the latter. (Diagram will follow in part 26.)

●To be continued.

A Traction Engine Driving Wagon



RAY
McMAHON

Ray McMahon makes a driving trailer to go with his 4 inch Burrell.



The 'living van' or traction wagon viewed from the back.



A convenient and comfortable driving position.

Just before I completed my 4 inch scale Burrell traction engine I decided to give some thought as to the type of wagon I would like it to pull. It was thought that if I could produce something simple that would be suitable for the driver and a passenger or two that would meet my immediate requirements.

I considered various ideas and decided that a vehicle that looked like a driver's living van might be the answer (**photos 1 and 2**). A look through various model engineering magazines and at photographs taken at steam rallies had already proved to me that the concept of driving a large traction engine

from such a wagon was quite practical. I also quite liked the idea of not having to sit on the traction engine itself. As I saw it, driving from a separate trailer would possibly be more comfortable for me and at the same time one would be afforded a view of the engine and valve gear, similar to the view that one sees when driving a full size traction engine. It also allowed me to fit a canopy to my model, which I thought would give it more character.

My main consideration for the design was that it had to be light and easy to handle, it also had to be capable of being dismantled in such a way that it could be transported both in



The wagon's chassis made from light weight alloy.



The chassis and tray length are dictated by the transport available.

My main consideration was that it had to be light and easy to handle, it also had to be capable of being dismantled in such a way that it could be transported both in the traction engine trailer and in the car that pulled it.

the traction engine trailer and in the car that pulled it. As it turned out the side panels and bulkheads can be transported in the trailer while the chassis (photo 3) and tray fit into the

car, the size of vehicle therefore limits the length of the wagon one can build (photo 4).

The final concept of the design started out with a simple wooden tray that formed the

base of the wagon. Attached to this are the two sides (photo 5); these are simply dropped into place and automatically located by the top edge of the tray. The whole assembly is then fixed together with the driver's bulkhead and the rear tailgate. The tailgate is fitted with a vertical sliding passenger door - rather than an opening door - for safety reasons.

This allows youngsters to be safely carried in the vehicle without the fear of a door being opened accidentally. Both these bulkheads in turn are fixed in place using bolts and wing nuts. The driver's seat is simply located in the front section on two plywood side walls behind which is carried the spare wheel (photo 6). Odds and ends as required for steaming etc. can



The side panels, inside.



The spare wheel site behind the driver's seat (removed here).



The passenger accommodation.

be stored in a space underneath the driver's seat. In the rear passenger compartment two simple bench seats are located on the top edge of the wooden side panel support angles (**photo 7**). They can be brought together to form one large seat if required. The inside of the wagon is lined with beauty board - it just so happened that I had some offcuts left over from a previous project. This finish does tidy up the inside

I had some to hand. The two longitudinal members are U section and these are cross-braced with square bars that locate the wooden tray. Underneath the main chassis are bolted two hollow box members; again, of alloy. (The front one pivots as seen in **photo 8**.) Bolted to these are four small trailer rubber suspension units. Being flexible and soft they provide a very comfortable ride both for the

The wheels have plain nylon bearings which are more than adequate and can easily be replaced should it be necessary to do so at a later date.

appearance. The outside panels are rebated with grooves in order to simulate planking. Sandwiched in between this panel and the inner lining panel is a window. The window is not visible from the inside as it is panelled over - again for safety reasons. In between the plastic window and the inner panel is a small net curtain. The background of the window panel is painted matt black in order to complete the illusion (**photo 2**). The floor of the wagon is finished off with panels of ribbed black rubber sheet that are all removable for cleaning.

The main chassis frame (**photo 3**) is made out of alloy, the main reason being that it is light and, more importantly,

driver and passengers. Along with the pneumatic wheels it is quite a good combination for the rigours of the rally field.

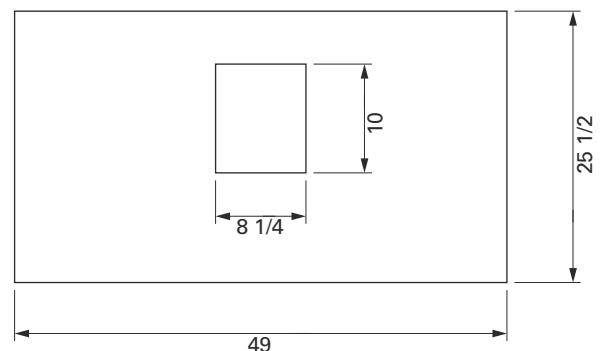
The wheels have plain nylon bearings which are more than adequate and can easily be replaced should it be necessary to do so at a later date. The front wheel pivot and the vertical thrust is taken up with a thrust bearing suitably located in a housing which is contained within the pivot. The brass hub caps locate on to the flanges that form part of the wheel bearings. These can be easily removed in order to gain access to the collars that retain the wheels on their axles.

That more or less completes the description. I have only

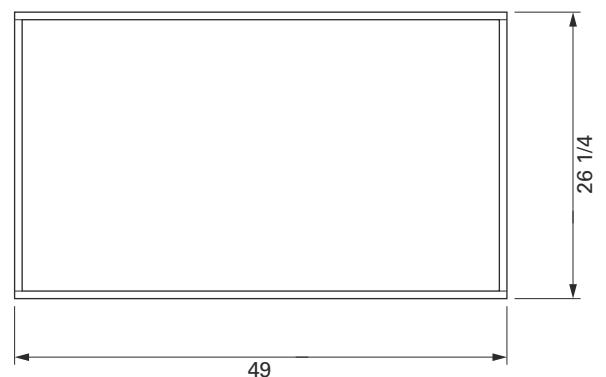


Showing the front pivot.

Fig 1



Window Side Panel



Floor Tray Panel
8in deep

Chassis Alloy 50in long
Wheel dia. 12in

given a few of the main dimensions (**fig 1**) for the chassis as it's construction will depend on the material available however I include the principle dimensions and

method of construction as used in order to form the body of the wagon. The dimensions however can be easily altered to suit one's individual requirements.

ME

Herbert Clarkson: 1929 - 2014

Adam Harris
remembers a
colleague and friend.

Herbert Clarkson, who died suddenly on Christmas Eve at the age of 85, was the 'Son' in H. Clarkson & Son of Layerthorpe, York, well known model engineer suppliers from the late 1940s until the early 1980s.

Herbert's father, Harry Clarkson had been building clockwork and electric O gauge and Gauge 1 models semi-professionally before the war and, in 1950, was given a contract to supply a large number of display models of the best of British built locomotives for the 1951 Festival of Britain. Herbert, having completed an apprenticeship as a toolmaker with Cookes/Vickers Instruments, joined him in this venture, forming the family firm.

Following the success of the Festival of Britain, the new firm was in constant demand to build further models, both for locomotive manufacturers and British Railways, and of

other British built machinery of all types; by the 1970s they were building model ships, models of the British ports, power stations and models of Rolls-Royce jet engines, which were cut-away to show the individual rotors that rotated in the correct relationship. Indeed there was very little that the firm wasn't prepared to make. They once made a 30 foot long working model of a steel rolling mill for India and Herbert went to set it up for Davey United who had commissioned it.

The firm was also building locomotive models for the then nascent National Railway Museum in York, usually in 3½ inch gauge, and live steam models for private customers and this was largely where the firm's range of drawings and castings for model engineers originated.

If Harry was a well above average model engineer, Herbert was that bit better, always able to solve the problems which arose when modelling complex machinery and could be found day, and frequently night, working on the drawing board in his little office between the front office at the firm's Layerthorpe works and the workshop and foundry.

Herbert always regarded himself as an engineer who happened to earn his living by model making, a distinction which largely stemmed from a professional need to build items to a time schedule; in his case this often involved making sure that Clarkson's' employees had all the information to build something and, when rarely necessary, he was always there to help and guide them to ensure it was made on time.

Clarksons of York, as it became, ceased trading in the early 1980s, largely as a result of the decline of British industry killing its main area of business and the sales of drawings and castings not

being sufficient to sustain the Layerthorpe premises. Thereafter Herbert worked for himself, building and restoring models, making specialist parts for the restoration of aircraft and for the National Railway Museum.

In 2000 some of his models were displayed in the Millennium Dome and last year he was pleased to learn that the Clarkson range of designs, which had disappeared from public view when the firm shut, was going to be re-introduced by new owners.

At his death he was working on a series of three 5 inch gauge models of Southern Railway Schools class 4-4-0s. He had completed the first and it is a superb testament to his skills.

By their nature, industrial models tend to be ephemeral but examples of the firm's work may still be seen at the National Railway Museum, the Smithsonian Museum in Washington, frequently when the Rolls-Royce Heritage Association are putting on a display and in the shape of *River Mite* on the 15 inch gauge Ravenglass & Eskdale Railway in Cumbria. All were shaped in some way by Herbert, and are wonderful examples of his abilities.

Avril, his wife of 64 years said: 'Herbert loved his work. Over the years he worked with people from all over the UK and the world. It's a testament to his generosity with his time and knowledge that many remained good friends. When times were hard, he worked harder, yet still devoted time to his beloved family.'

Always the most affable of men Herbert will be greatly missed by all who knew him. A devoted family man, as well as his wife Avril, Herbert leaves his son Paul, and daughters Anne and Sally and their children, to whom our condolences.



Sling your Hook!



TONY
FINN

Tony Finn can now safely lift his locomotive.

A couple of years ago I bought one of those little 250kg capacity electric hoists that the discount supermarkets sell from time to time. Having got it installed on a beam in my garage workshop, I then had to decide how to use it to lift serious weights, notably my 5 inch gauge tank engine which weighs over a hundredweight

and is not a one man lift. I needed to get it from its maintenance trolley to the ground level trolley from which it can be rolled down a small ramp onto my garden track.

What to use?

I cast around for a suitable simple method of slinging the engine without damaging the paintwork (**photo 1**). A trip to the local scrapyard with a box knife and an adjustable spanner produced two identical straps, taken from the rear seats of a wreck. The rear seats of a car generally do not get the same amount of use as the front ones so I considered they would be in better condition and, sure enough, there was no sign of any fraying. Pulling them right out and cutting off at both ends to give me as much length as possible was the easiest way to recover lots of webbing together with the two buckles, which form the hook plates. I was fortunate with the buckles; the ones I brought home each had two webbing slots, which proved to be extremely useful and saved a lot of work. Unfortunately I can't remember what sort of car they came off, nor why they had two slots. Most buckles

have only one slot and not enough metal to cut another one, which means you would have to make new ones. If you are interested in following my example it's probably worth having a look around to see if you can find some with two slots. The webbing was cut to the maximum identical length I could get out of the two pieces.

The hook plates

The double slots make it possible to use the buckle to attach both end loops of the webbing but they also allow for use of an adjustment loop.

Figure 1 explains how this works. I enlarged the latching holes of the buckles to fit on the hook on the hoist.

If you have to make your own hook plates, these are typically shown in the drawing. Except for the slots, the design is not critical, but the metal should be thick enough that the edges of the slots can be well-rounded and do not present a sharp or thin edge to the webbing so, with this in mind, I would suggest ¼ inch or 6mm steel plate is suitable. My 'ex-buckles' are thinner but are smooth plastic lined.

Sewing the end loops

To make the end loops you will need a sewing machine (or someone who has one!).

Sew the upper loop first. Put about 6 or 7 inches of belt through the bottom slot



A solution to the problem of lifting the engine alone.



The assembled hook and belting showing the stitching pattern.

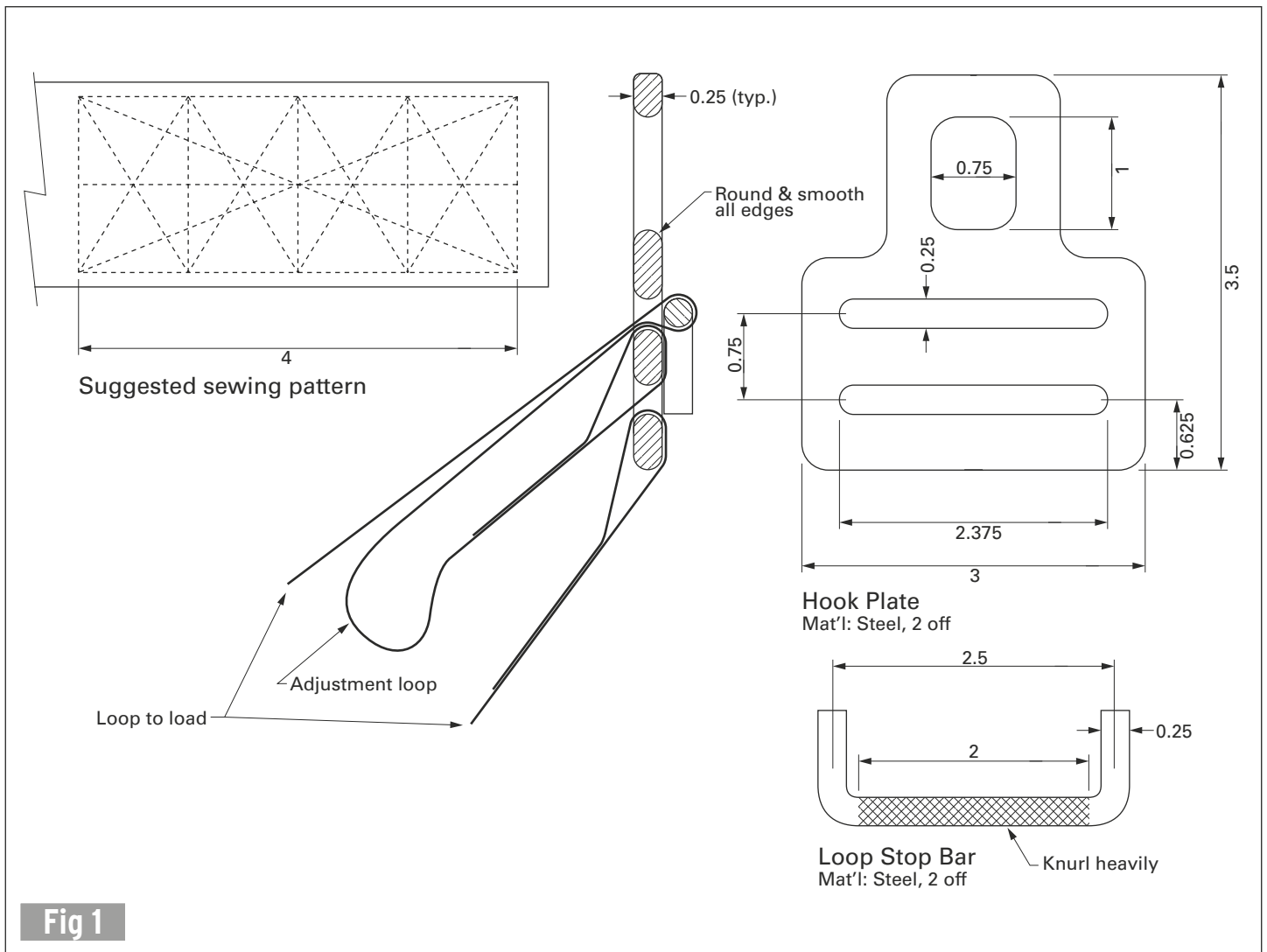


Fig 1

of the hook plate, then back through the top slot, and line it up for sewing (**photo 2**). Use polyester thread (which doesn't rot) and sew it in a 4 inch pattern as shown in the drawing and **photo 3**, making sure that the free end - which might fray - is at least $\frac{1}{4}$ inch beyond the sewing line. You can seal the free end with Bostik to stop fraying if you think it is necessary. Illustrated is similar to the pattern I used and it has been very satisfactory but if you want to add more lines of stitches for additional security, I won't try to dissuade you - but I didn't find it needed it when finally tested by suspending my own weight.

Put the other end of the webbing through the bottom slot and back on itself, making sure there is no twist in it, and sew as before. Repeat all for the second sling.

The loop stop bars

For these, take two pieces of $\frac{1}{4}$ inch or 6mm steel bar about 4 inches long and knurl them heavily over the middle for a length just longer than the width of the belt. The quality of the knurling pattern is immaterial, as long as it will grip the webbing, but it does need to be heavy, i.e. fairly rough! If you have a double wheel clamping knurl this is relatively easy but if you have only a single wheel working from one side you may have to do it in stages, moving the bar out of the lathe chuck after doing a small area. After knurling put $\frac{1}{2}$ inch of the end of each bar in the vice and bend through 90 degrees. Repeat for the other end, so that you have a flat U-shape. The turned-up ends are important: they prevent the bar from rotating when the webbing is in tension and also stop the bar from slipping out sideways.



This stitching is more than adequate.

How to use the slings

To use the adjusters, a loop of the webbing is pushed through the top slot of the end piece and the U-shaped loop stop bar is inserted into the loop. Pulling the loop back locks the loop around the bar against the slot and it is then positively locked and will not slip. Mine never has, anyway! Photograph 1 shows the slings in use.

If you are using buckles from a car to make the end pieces, you may have to enlarge the holes, as I did, to get them to fit on the hoist hook. Alternatively you can use a shackle to hold them, which will then go over the hook.

Before using the slings, I hung up each end piece and stood in the loop to check that it would take my weight (180lbs) and found that this was no problem!

ME



The importance of careful brickwork

Dear Diane; It seems a shame when a nice model of, say, a horizontal engine is shown on a plinth that has not been given the same attention as the engine. I am thinking of when the plinth represents brickwork or masonry. (When it is a display model on a base of polished hardwood, that is another matter.) There seem to be three main reasons why they lack realism. One is scale - bricks are often shown too big. A bricklayer picks up a brick with one hand and he has a trowel in the other. Even in the case of a freelance model it is possible to estimate the scale by assuming the size of the flywheel, when it is possible to use the convention - a brick plus joint measures 9 x 4½ x 3 inches - it is possible to determine a realistic looking size.

The second difficulty is colour. Bricks are made individually and even a fairly regularly coloured brick such as a Staffordshire blue will have small variations in colour according to where they were in the kiln and these variations give the finished brickwork its interest and life. Though often modelled so, brick pointing is seldom white. The colour will vary according to the colour of the sand used in the composition of the mortar. Older mortar would have been gauged with lime more while more modern mortars would use at least some Portland cement which is more grey in colour than lime. Finally - the real give away - bonding! So often the brickwork is shown as stretcher bond, where only 9 inch faces show. The perpendicular or vertical joint is centrally over the stretcher, above and below, giving a break of joint of 4½ inches. With this bond it is only possible to build a skin of brick work 4½ inches and this not really stable over about 2 or 3 feet high. Since the plinth for an engine was often a brick box filled with rammed rubble, something stronger than 4½ inches would

be needed. English bond is said to be the strongest where courses of all headers and all stretchers alternate with all headers central over the stretchers below, giving a bond of 2¼ inches. Flemish Bond is virtually as strong and here headers and stretchers alternate in each course. Headers are centrally over stretchers below giving a bond of 2¼ inches. Both of these bonds can be arranged to give a wall thickness of 9 inches to 27 inches and occasionally a greater thickness. With hard engineering bricks like Staffordshire blue and South Water, a great range of 'specials' were made: bull nosed to form rounded corners, doubled bull nosed to form a coping on a 9 inch wall and extra large 9 x 9 x 3 inch bull nosed on two adjacent edges to form (among other things) a corner of a 9 inch coping. There were many others but the two most noticeable ones are the plinth brick which steps forward 2¼ inches, with the projecting top edge chamfered at 45 degrees and the paviour with a pattern on top like a bar of chocolate. The clatter of the horse shoes and steel tyred carts on these hard bricks is the most Victorian of sounds.

Probably the best places to see brickwork used in conjunction with mechanical engineering is the wonderful Nineteenth Century bridges and retaining walls to cuttings associated with railways. It never ceases to impress me

when, miles into the country, you come across a railway bridge with a beautiful elliptical skew arch where the upper and lower ways are not at right angles. If you get close to the abutment and look up, perhaps forty feet, all the prebends are straight as a die. Probably most of the men who built them were barely literate but apprenticeships made them craftsmen. Where stone is used to form the plinth there can be no generalised advice. Stone varies so much in colour, in the size of material acquired and whether it can be laid in regular courses or random shapes and sizes and whether dressed or laid more or less as found. The only thing one can say is try to find an example, preferably local to where the engine would have been installed, and copy it carefully.

I do not know whether I am being pedantic but I saw an instance some time ago in the MEX of a wall engine where the prototype would have weighed several tons presented on a 4½ inch wall! Even the beautiful Cornish waterworks engine by Neil Carney, recently featured in *M.E.* has brickwork that, in the photograph at least, by colour and bond is a bit 'doll's house'. In spite of all the above I still admire enormously the dedication and patience in the work of your contributors.

Yours truly
Denis Oates
(Wanstead, London)

Write to us

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Alfred Angas Scott

Dear Ms. Carney; There is a slight mistake in the article about the Bradford Industrial Museum (*M.E.* 4498). In the part about Scott's. Scott's name is given as *Angus*. It is correctly Alfred Angas Scott. It may be of interest to know that Scott made a number of different engines, from a single cylinder to a six cylinder car engine that was fitted into an Aston Martin. Scotts only made two stroke engines. They made a three cylinder motorcycle engine, six/eight complete motorcycles being made. A modified version of this ended up in the Saab cars that used to win so many car rallies. There were a few 'one offs' and short runs, but were not viable. I hope this is of interest.

John R. Yeoman
(Burnholme, York)

Spin indexer advice

Stewart Hart's article on setting up the spin indexer (*M.E.* 4498) will be very useful for model engineers who have not come across it before. Having used one in industry for many years, there are some useful tips I can offer on getting the most out of one.

Where the indexer is set up (as in photo 14) for drilling, it is useful if you mill the four sides of the casting square. Then you can put the indexer into the machine vice on a couple of parallels. You can put it in either way, parallel to the table or at right angles.

Also, you can make your own indexing disc with any layout of holes you need for a special job. The holes don't need to be symmetric, just at the correct radius. If you have a large enough component, you can bolt it on to the front of the indexing disc, perhaps with spacers, rather than using a chuck.

David A. Clark (Grimsby)

Wheel speeds: an interesting anecdote

Dear Diane; A letter in *M.E.* Issue 4496 regarding wheel speed reminded me of a book that I have entitled *The Steam Locomotive In America* by Alfred W. Bruce, published in the USA in 1952. Bruce was a Chief Engineer at the American Locomotive Company (ALCO) in Schenectady, New York and his book charts the history and design of the steam locomotive in the 20th Century until 1950 as the last steam locomotives were built by the big three manufacturers (ALCO, Baldwin and Lima) in 1949.

When talking about speeds he said that up to about 1930 the maximum speed of a locomotive in miles per hour was the same as its driving wheel diameter in inches. This rule of thumb was often exceeded in practice as better cross balancing became more common. The maximum horsepower outputs were generally reached at about 300 rpm for modern heavy freight locomotives and about 360 rpm for passenger locomotives.

Driving wheel diameter speed is 336 rpm for all locomotives. This means that, for instance, a Pacific locomotive with 6 foot 8 inch (80 inch) driving wheels will be travelling at 80 mph when the driving wheels are rotating at 336 rpm and a 5 inch gauge Pacific with 7 inch driving wheels will be travelling at 7 mph when its driving wheels are rotating at 336 rpm (assuming the locomotives are not slipping).

As train speeds in the USA increased, so did complaints from drivers ('Engineers' in the USA) that the main driving wheels were lifting off the track at high speeds because of the additional counter-balancing weight added to the wheels for cross-balancing the reciprocating and rotating parts. To ascertain just what did happen under these conditions, special slip tests were run over greased rails on the New York Central in 1938 with one of the latest 4-6-4 Hudson type locomotives equipped with roller bearings on all axles and light weight moving parts. These tests showed that only a very slight wheel-lift off the rail occurred at the top slipping speed of about 700 rpm! There was no damage to the locomotive or the track during these tests. This driving wheel speed equates to nearly 160 mph if the wheels weren't slipping! There were no more complaints from drivers after these tests.

Yours faithfully,
Malcolm Young (Cheshire)

An engineered alternative to 'fakes'

Dear Diane; There's a subject I've been meaning to question for some time but the article in the current *M.E.* on the Red Dragon really brings it to the fore.

If a model engineer builds a clock, it's a fully working representation of a clock. When he/she builds a scale aero engine; ditto. Likewise a scale road locomotive and a scale steam railway locomotive. In none of these does any major departure from the full size

Keith Wilson

Hi Diane; I was so sorry to hear of the passing of Keith Wilson. I never knew him but he was a prolific maker of 7¼ inch gauge locomotives and wrote in an authoritative yet approachable way, always with a touch of humour. His series on model locomotive construction (published in the *Model Engineer*) was excellent. I have a Xeroxed copy of the whole thing, which I refer to frequently. I have always thought that it should be published as a book; it would be very useful for newcomers to our hobby.

Best regards
John M. Smith

original exist except for the impossibility of scaling certain pieces of physics, as in the steam whistle on a locomotive. Even the current spate of rail gas-turbine locomotives such as the English Electric GT3 4-6-0 and the GWR gas turbine locomotives - these are modelled in their entirety - chassis, body, and powerplant - with no short cuts or cheats.

Yet when a person buys an off-the-shelf, ready-made moulded body and chassis shell, adds a few minor details and then goes on to put in a pair of car-type batteries, a sound board and speakers to make a 'brm-brm' sort of noise, how can this be classed as model 'engineering'? It's a cheat, a fraud, in comparison with the above pieces of real model engineering. The look of the Red Dragon is exemplary but how much of the constructor's engineering, as opposed to detailing and electrics, went into it? Surely, if you are going to build a scale working model of a diesel-electric, diesel-hydraulic or diesel-mechanic locomotive, then it should at least have some sort of I/C power plant either driving a generator or directly driving the wheels! Maybe petrol rather than diesel, but still, reasonably true to the original. I'm not thinking of that magnificent model Napier Deltic that has been seen at exhibitions, though that does make a small and sensible sacrifice to originality by having spark and not compression ignition. The gas-turbine models are true to their originals, so why not the Red Dragon etc.?

At 80 I am now far too old to try and build a power plant myself but have, over recent years, roughed out the idea of a water-cooled 18 (2 x 9) cylinder four-stroke swash-plate engine, driving a generator, that would be slim enough to fit a 5 inch or 7¼ inch gauge body and, in the former, have a capacity of 150cc with low revs, smooth torque and 'easy-on-the-ear'(!) sound levels - unlike miniature single cylinder I/C engines. The engine would have a chassis of four parallel bars, carrying all the components set out in a linear formation, divided by two end and two intermediate aluminium spacer plates. The only 'complicated' piece of engineering would be the built-up angled crank on which the non-revolving swash-plate would sit on roller bearings. The only parts I still haven't fully thought through are the two cylinder heads with their water cooling, desmodromic valves and spark plugs. The timing would be optoelectronic and the valves at each end, each operated by a single rotating disc double cam, driven at half shaft speed by an epicyclic gear at each cylinder head. At one end would be the water pump, oil pump and an air fan for forced air circulation; at the other, the flywheel with starter excitation coils and then the generator. There would be a carburettor at each end. The water jacketing would be flat plates surrounding the two cylinder sections and, similarly, around the central 'crankcase' section with oil mist spray from the top onto the trunk guides ➤

and swash-plate, and a dry sump at the base. The swash-plate to be controlled against revolution by four lightweight double Watts-linkages to the 'chassis' division plates.

All control by wire to a PC for testing, and by radio for running, with full telemetry of all functions: water, oil and air (intake and exhaust) temperatures, oil pressure, fuel, oil and water levels; heated air intake for starting, engine revs, main, starting and radio battery status; traction current level, brake status, drive direction and track speed. Developed HP would be a nice touch!

The idea for the cylinders is for them to be plain pieces of 1 inch ID steel tubing, held between pairs of aluminium slab plates, the whole in compression longitudinally by the four threaded 'chassis' bars with tube spacers. So the whole engine is slim, yet powerful and in one lightweight easily installable/ removable unit. With a power plant like this, scale train speeds of 100 mph (actual 8-10 mph) with sizable loads of passengers should be easily attained, with good acceleration and low noise levels.

The power plant would involve very little in the way of machine-shop work and no large or heavy components, so the whole thing would be relatively light in weight but very compact - and relatively easy to build and handle! The quality work would come in building the control electronics!

Diane, I was aiming at the current craze for fake engines in general - and battery-electric in particular. All battery and sound effect and no true engineering guts! At least the latest locomotive at BSMEE is a genuine I/C powered locomotive, as was the 7¼ inch gauge Pegasus, several years ago, which latter uses a petrol engine and an hydraulic drive, even though it wasn't a copy or miniature of an existing, or past, 12 inch to the foot original. It has the outline of an industrial I/C engine locomotive and, in that, it is genuine.

I hate fakes, including those ghastly tourist 'trains' that toddle around places of interest, towing carriages of happy holiday makers, with the fake steam engine going 'brm-brm' instead of chuff chuff ... There is just no need for fakery, in anything, least of all in our model engineering.

I should make it clear that I meant no criticism of the Red Dragon locomotive - it does look superb.

David Hockin
(Portishead, Bristol)

Tailstock

Dear Diane; In the otherwise very good article by Stewart Hart in *M.E.* 4499, he mentions a 'tail stop', which may be confusing for some readers. The correct name for this part of the lathe is 'tailstock'. The dictionary definition is as follows: 'Tailstock: the adjustable or sliding head of a lathe containing the dead centre (or tailstock chuck, or tailstock die holder)'.

Yours sincerely,
David R. Machin (Rohrham)

Restoring faith

Hi Diane; I trust you survived the festivities. I for one am happy to see the back of them and get back to something resembling normality.

I just thought I'd drop you a quick line regarding some of the nice folk who inhabit the Model Engineer forum (www.model-engineer.co.uk). About six months ago the reversing switch went on my lathe so I posted on the forum, asking whether anyone might have a spare. One chap said he reconditioned them and he had a spare he could send me. All he wanted in return was the old switch so he could recondition that one. Needless to say I sent him the old one and a small contribution to the fighting fund.

Again, a few months ago I posted regarding a carburettor I needed for the radial engine; another chap said he had lots and would sort me a suitable one out. Again he didn't want any payment - not even the postage - so I gave him my address. As nothing materialised I thought no more about it. That is until I came in from the shed one Saturday and my wife asked, 'what have you been buying now?' The postman had rung the bell while she was upstairs. The

package was air mail from New Zealand and contained not one but two carburettors! What a nice change from the "I'm not renewing my subscription" posts that we sometimes see on the forum.

Regards,
Mick Knights
(Hastings, Sussex)

An ironic conflation

Dear Diane; I apologise for accidentally conflating completely different processes for ironworking in the Forest of Dean article (*M.E.* 4498). Sharp-eyed readers will have spotted my error.

The first iron to be produced in the Forest was 'bloomy' iron, made in small furnaces. This wasn't cast iron. The spongy iron mass produced was hammered to remove impurities and make steel.

Blast furnaces used from Tudor times onwards created a true cast iron. This cast iron was then subject to a finery process, including hammering, to make wrought iron, not steel.

Iron was reheated in a cementation furnace with carbon to make 'blister' steel. There are examples at Derwentcote, Co. Durham and in Sheffield but I don't know if any were used in Dean. Sheffield steelmakers then preferred to import better quality iron from Sweden as their raw material.

In the mid 18th Century Benjamin Huntsman developed crucible steel in place of blister steel. This was of consistent quality and helped ensure Sheffield's place in quality steel making. Robert Mushet of Coleford in Dean created many different alloys using crucible steel but hammering wasn't part of the process.

Henry Cort in Gosport invented the 'puddling' process to turn cast iron into wrought iron but by rolling rather than hammering the iron. I am hopeful that his work and the history of iron and steel making can be subjects of further articles.

Yours sincerely
Roger Backhouse

More reliable connectors

Dear Diane; I have just read with interest the two articles by Derek Alford on the design and building of his two electric locomotives in issues 4495 and 4497 of the *Model Engineer*. I find the details of the design most interesting and a very good example for others who wish to also design and build similar locomotives.

I did find one small fault, which other builders of such locomotives - as well as other models - should note. It is not good to tin with solder multi stranded wire, which is fastened under a screw terminal as, with time, vibration and temperature the solder will 'cold flow', with the result that the contact will become intermittent. For such connections a metal sleeve should be used without any solder at all, as is standard in many military applications. A colleague in the Surface Warship Association wrote an article in their own magazine, thanking me as it made his model ship as reliable as he required. Others have done similar.

Philip T. Bellamy, B.Sc., M.S.E.E., (Hons), M.I.E.E.E.
(Brütten, Switzerland)



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William Spence Locomotive for 7¼in. Gauge



CLIFF
ALMOND

Cliff Almond describes an unusual narrow gauge 0-4-0T for 7¼in. gauge.

PART 9

Continued from page 711
(M.E. 4495, 14 November 2014)



Side view showing the large water tanks.

During a short break to Ireland the trip culminated in the inevitable 'pilgrimage' to the Guinness Brewery in the centre of Dublin. Part of this very interesting museum describes many of the company's modes of transport used over their long history, including the development of their own narrow gauge railway that once ran around the site.

In this final instalment of what I hope has, so far, offered an overview of both the prototype and the on-going design work for the model, I offer a description of the platework.

Apart from the footplate and similar sized area ahead of the smokebox, there are principally only three main constituents of the platework: the side water tanks, the engine covers and the shrouding around the boiler.

Water tanks

Dealing with these items first; as can be seen from **photo 23**, they take up the full length of the frames and are nearly as high too. Although fully riveted, I am led to understand that the one at Amberly Museum & Heritage Centre had its tanks welded up late in its life as they had become corroded.

At first glance you would imagine these to be able to hold quite a large amount of water. However, the reality was that as previously described, the design parameters of the Guinness Railway with respect

to the loading gauge (in order to negotiate the confines of the brewery and, of course, the spiral tunnel that was built to overcome the significant difference in levels across the site) meant they were only around 12 inches wide. On the model these scale down to just under 4 inches wide.

The additional drawback of the design, that further reduced their volume, was that the two vertical connecting rods that run between the crankshaft and the rear wheels passed through the tanks; effectively removing around four gallon's capacity from each tank.

Photograph 24 shows the view looking down through one of the tanks, illustrating the connecting rod running through it and in **photo 25** the rod disappears, seemingly, into the tank! Therefore, I suspect

that on a longer club track, additional water will need to be carried on the driving truck as a matter of course rather than just for emergencies. I am also expecting some issues with the injectors and the water temperature, given the close proximity of the tanks to the boiler and the radiated heat passing easily through the frames.

Engine covers

The engine covers span the entire length of the engine, too. These have two heavy hinged lids that open up and back in order to gain access to the engine for maintenance and lubrication. Apart from the vertical connecting rods nodding up and down when moving, the driver could see no other moving parts.

When I was surveying Number 13, standing on a step ladder to gain access, I almost inadvertently let go of one of them in a bid to maintain my precarious balance as I tried to close it! I just wonder how many engine drivers *did* actually let one of these go with a bang; sending horses and their carts loaded with barrels of the 'black stuff' stampeding off in all directions; and in the process destroying the whole theory of designing an engine that would not frighten horses!

On the model these will probably be fabricated from 16g steel, with some additional framing or bracing so that they do not twist with use and then not close properly.

Shrouding around the boiler

The third principal item of platework refers to what is described as 'copper work' on the original drawings – being detailed on a completely separate sheet – further emphasising the importance given to these parts.

This actually shrouds the boiler on Number 13 (and I guess them all), both on top and underneath, with some nicely flanged and polished plates that look quite nice at the footplate end.



Looking inside the water tank.

When I questioned one of the museum Guides as to why he thought these were used, I was told that there appeared to be no explanation. My own view is that they acted as a form of insulation around the boiler, rather than using some other material. They do not appear to be cladding in the sense that they cover and retain any insulation material as per normal practice. Indeed, they are very thick!

Of course, on the model, I am still deliberating as to whether to replace these with more conventional, thin cladding with lagging underneath. However, in practice, trying to get all this in place, under the motion in particular, may prove to be a problem! Given that the boiler is 'blanketed' with the engine covers and the two side tanks, I don't believe boiler insulation will be required. Additionally, with the cylinder block fully enclosed and protected from cold air, I guess condensed steam in the cylinders wasn't a great problem either.

oscillating cylinders) one other model in production – the part-built 5 inch gauge version owned by a fellow model engineer in South London. It was as a result of this person contacting our former editor that I was lent 60 or so original prototype drawings of this engine. (*There is a photograph of this model in the MEX Report, page 103 M.E. Issue 4499 - Ed.*)

I am very grateful for this and also to my good friend and fellow member of Nottingham Society of Model & Experimental Engineers, Prof. Pete Thomas, for the use of his A0 scanner; enabling me to copy the drawings. These have become invaluable in designing *William Spence* thus far. Some of the drawings are quite faint in some areas and the ability to 'doctor' them on the PC has helped immensely.

There has been some interest in building the engine and one model engineer is already some way forward – as shown in the photographs in previous instalments.

As you can imagine, there is a lot of detail design still to do and, I would imagine, some more detective work to be done and history to un-cover in the process.

With all this in mind, with our Editor's permission, I look forward to providing updates on progress via these pages as things slowly move forward. **ME**

Summing up

So far I have spent several hundred hours travelling to Wales and Dublin, designing and fact-finding generally. However, via the reach of *Model Engineer* and the publication of this series, I have only discovered (save for a tiny O-gauge version with



The top of the connecting rod.

CLUB NEWS



GEOFF THEASBY

Geoff Theasby reports.

One night, listening to the BBC World Service in the small hours, I caught the tale of a PhD student, off to Kenya with lots of expensive optical equipment, to test the eyesight of the locals. Whilst using his smartphone he had an idea. He came up with a device - basically an ophthalmoscope produced on a 3-D printer and fitted with a lens and a few prisms, which clips onto the smartphone and enabled him to photograph the retina at the back of the eye and e-mail the picture to an optician capable of analysing the image. The device costs only a few pounds and can be used by almost anyone.

At this juncture it is relevant to say that I've just been to the opticians, for the second time in six months, thinking my eyesight had further deteriorated. I have double vision and my right eye is much more short-sighted than my left. After a thorough eye test the optician confirmed my fears, says my brain should be ignoring the non-dominant eye, prescribed new glasses again, plus reading glasses for the first time and will send me to one of the hospitals that has a double vision clinic; which one, I do not yet know. I started to laugh and said that I was irresistibly reminded of the Monty Python sketch about climbing the twin peaks of Kilimanjaro. She gave me an amused, tolerant and patient



Napier Railton Special rear springs.



Royal Scot at Stockholes Farm. (Photo courtesy of Ivan and Barbara Smith.)

smile and said, 'My dad will be able to tell me what that is all about'. Ahem! #showingmyage. My eyes are, however quite healthy in themselves but I can't drive, as I'm not confident of my position on the road or where parked cars to my left actually are. Focusing closely on small details also defeats me. So having chosen my new glasses (much nicer than the 'Steampunk' goggles I did the eye test in) I returned home to both wives, ordered two T-shirts saying 'I'm with stupid' and arrows pointing both ways and awaited my appointments at the hospitals. At least I won't be short of transport; for me, buses always arrive in twos, if not fours, but there are twice as many pedestrians about when I go shopping, which made Sandown Park difficult. By a strange coincidence, on our first night in the hotel, the management provided us with silly hats and a Christmas cracker. Out of it fell a joke which would have disgraced Arthur Askey and a pirate's black eye patch! Do they know something I don't?

My wife, Deborah, enjoyed the Makers Area at the exhibition and bought herself a soldering iron, quite unprompted by me. She says it is to use with 'fusion fabrics' but I can see I shall have to keep a close eye on my stocks of op-amps, power transistors, etc.

An article in *The Engineer* suggests that magnetic

transmission may make gearboxes obsolete. <http://www.theengineer.co.uk/news/magnetic-transmission-could-spell-the-end-of-gearboxes/1019570.article>

Also see <http://www.magnomatics.com>

In this issue: Brooklands, taxis, coal, Corian, Friesians, lantern clocks, a Forney, Grimsby and death.

To begin, here is Graham Pearce's Royal Scot, from Huddersfield, as it would have appeared in the late 1920s, seen at Stockholes Farm Miniature Railway visitors day (photo 1).

W. www.sfm.co.uk

Whilst attending Sandown Park, I took the Saturday off to visit Brooklands Museum, which was fascinating. I admired the Napier Railton Special but look at the rear springs (photo 2)! I've seen smaller springs on a locomotive. Some of the famous banking is still there and several aircraft, including a Concorde and I got up close and personal with a Harrier cockpit. They have a replica Vickers Vimy, as flown across the Atlantic by Alcock & Brown in 1919, in this case by Steve Fossett in a 2005 re-enactment, and the Wellington Bomber rescued from Loch Ness in 1985 and now being rebuilt. I have a picture of my Dad at the controls of one of these in WWII (he was an engine fitter) so I took a photo from about the same angle,

which I will print out and have framed and compared with a blow-up of his original.

The Link, from **Ottawa Valley Live Steamers & Model Engineers** mentions that some members are running low on suitable coal. A bulk buy was arranged some years ago for Welsh steam coal from a UK supplier. This may be repeated unless more local supplies can be obtained. The pneumatic tie press (M.E. 4498) is proving very useful. Guy Cadrin is making 80 organ stop knobs for a Quebec pipe organ built in 1943 with 6000 pipes. The material is Corian which was originally for use in kitchens and bathrooms but machines like brass and polishes well.

W. www.trainweb.org/ovlsme Model & Experimental Engineers Auckland Newsletter, November says that Graham Quayle has refurbished a Tanner thicknesser. Made in NZ before import restrictions were relaxed, it is a well made machine. Ray Brown has made a simple LED torch holder for his lathe. Basically it is a short tube with an O-ring inside and a spigot to attach to a magnetic holder. Murray Lane reviews the recent book on Cherry Hill and her models. I have this book and it is every bit as good as the reviews state. Murray also spent a holiday in South Island, including some train trips, and visited an agricultural show at which was displayed many stationary engines, including a Famous Twigg Engine. We know this because it is painted on it! He last went in 1953. Not much has changed, including the weather, being wet and windy.

Bradford Model Engineering Society's Monthly Bulletin for November reports a break-in, followed by pointless wanton damage. Quite what motivates such people is difficult to understand. On a happier note, President, David Bedding was in London in October supporting an acquaintance who was running a 1903 Oldsmobile in the 119th London to Brighton run. This celebrates the 1896 Act of Parliament that abolished the need for a motor vehicle to be preceded by a man on



Patriot locomotive valve gear detail.

foot. The need for him to carry a red flag was abolished in 1878. However, a red flag is symbolically destroyed at the start of every run. David and Mary Jackson's two-year old grandson got an early Christmas present. He loves diggers and construction sites and has already 'cabbled' a real digger, so he got a miniature hi-viz vest! Following a recent talk on small, automated multi-rotor helicopters, it appears from the Institute of Engineering Technology Journal that DHL have been licensed to deliver small packages to an island in the Friesians by such a method.

W. www.bradfordmes.co.uk My favourites at the Model Engineer Exhibition were the WWI pigeon van, the radio controlled Land Rover, the WWI barge loading diorama and of course, the Duke of Edinburgh Trophy winner, the Patriot locomotive, complete even to the corks in the oil cups on the valve gear (photo 3), the tiny slotted screws in the boiler cleading and the miniature Daily Mirror in the driver's cupboard.

Whilst waiting for a taxi in Esher, we amused ourselves by observing passing cars. About every other car was a Mercedes, BMW or Range Rover. How very unlike the home life of our own dear Sheffield... Once, we got a taxi that was a Honda Hybrid. I was most impressed with the silence and performance. I also picked up the man-flu so I am writing this from my sickroom, with not even a chocolate biscuit or sustaining hot toddy to revive

my flagging corpse – Oh! What's this? Enter Deborah, stage right, bearing gifts, to wit, chocolate bourbons and red wine!

Editor, Jon Williams, of Birmingham Society of Model Engineers, draws my attention to a remake of The Italian Job using 1/10 scale models, made at the track in Minworth, in which some fine editing incorporates scenes from the real film. Very well done! www.youtube.com/watch?v=0NU2B5D0v8s The BSME Newsletter, October/November, reports that £8,232 has been raised for charity this year, supporting Solihull Life Opportunities and Solihull Downs. In October, William Sunderland displayed his collection of lantern clocks dating from around 400 years ago. Pre pendulums, they required winding several times a day and were very expensive. A Gauge 1 GCR 2-6-4T by Reg Peach was exhibited on their stand at the Midlands exhibition. Reg says, 'This

locomotive was made over 20 years ago to a Paul Forsyth design. Many miles have been clocked up over the 20 years but, as with many live steam locomotives, painting was the last job to be completed. This was done just two years ago! It is fitted with an axle pump but has no bypass valve. The pump slightly under feeds resulting in a 35 minute run without the need to physically pump water via the hand pump. Fuel used is methylated spirits and lasts for the duration of the run.

Lining was carried out using special paint filled pens, which makes for an easier system to the normal paint pot pens.'

W. www.birminghamsme.com

On Track, from **Richmond Hill Live Steamers** tells us that Toronto SME's John Chappell is 100! Congratulations, John! Ken Andrews writes on a plea by Madison Kirkman, who is only 16, to help save an historic McKen railroad car of 1901 and also on the 2 foot gauge railways in Maine, specifically the Maine Narrow Gauge Railroad Co. & Museum's Monson Railroad No. 4, an 0-4-4 Forney. (That's a lot of 4's!) It was built by the Vulcan Ironworks in about 1910.

Blast Pipe, from **Hutt Valley & Maidstone Model Engineering Societies**, reports a new company being set up to produce coking coal for a steel mill, made by treating waste wood with microwaves. This might solve the coal supply problem Down Under. Campbell Rollo builds and races 1/10 scale radio controlled full-contact speedway cars (in the UK, stock ➤



*Campbell Rollo's r/c speedway car.
(Photo courtesy of Campbell Rollo.)*

5



Ian Welch's J1211 Gloria from Blast Pipe. (Photo courtesy of Trevor Heath.)

car racing. Speedway is motor bikes) (photo 4). Ross Johnson is designing and testing a gas burner for his Invicta, using the stainless steel gauze from a kitchen sieve. Work is on-going. Ian Welch's 7¼ inch gauge J1211, Gloria (photo 5) has been run for the first time since 2008 and the injectors were a little sluggish but it looks a magnificent model.

W. www.hvmes.com

Grimsby & Cleethorpes Model Engineering Society contains a tale of how Chris Crew took his wife to see Sting perform in New York, which somehow transmogrified into a tour of the local railways and even a visit to Grimsby, Ontario. The Long Island Rail Road, now a commuter system, is the only one still operating under its original name and charter since its formation in 1834. Yes indeed! This tale is most interesting but never actually mentions whether they saw Sting, or liked the show...

W. www.gcmes.org.uk

The Link, from **Model Engineers' Society (NI)** for December details more of their history, this time from their relocation in 1970 to the Ulster Folk & Transport Museum at Cultra. An item from an old newspaper describes how the first steam bicycle was built in Boston, Mass., USA, by Sylvester Roper in 1867. He died in a crash on a later machine in 1896. There is

much on the Internet about this inventor, who was previously unknown to me. Terry's tips concern removing a broken tap or drill from a hole in non-ferrous material using a solution of Alum.

W. www.mesni.co.uk

ESSMEE Newsletter, December, from East Somerset Society of Model & Experimental Engineers, says that their Open Weekend was one of the best attended ever. The 7¼ inch gauge AGM proved to be a manic week, with good weather only broken for the AGM proper, when the rain forced everyone under cover, increasing the attendance! David Hale wrote up the open weekend from a 5 inch gauge perspective. Robin Duys wrote up the above AGM

and David Hale visited Gilling for the GL5 Mainline Rally. An item from the BBC magazine, *Monitor* described the life of a Mr. Railing and his ultimately successful attempts to die in a rail crash.

W. www.essmee.org.uk

Sutton Coldfield Model Engineering Society's Steaming Ahead says that, due to lack of contributions, they will move to bi-monthly publication, with an e-mail newsletter should anything be forthcoming in the intervening period. The high level track required considerable maintenance, also involving the signalling system. The bonfire party went well, even acquiring a 'Guy' seated in an ancient wicker chair. Despite the wet weather, he eventually burned well and a good time was had by

all. (Except for the Guy.)

W. www.scmes.co.uk

A missing photograph again permits me to use one of my own photographs, in this case the Costermongers' barrow from the **Guild of Modern Wheelwrights**. This stand won a well-deserved **Club Award** (photo 6).

And finally; you know you work in a laboratory when:

- You wonder what absolute alcohol tastes like with orange juice.
- Warning labels invite curiosity rather than caution.
- You cool your beer with dry ice.

Contact:
geofftheasby@gmail.com

6



Costermonger's barrow at MEX on the Guild of Model Wheelwrights' stand.

DIARY

FEBRUARY

- 3 Romney Marsh MES.** Colin Clark: Clan Line. Contact Peter Lee: 01797 363466.
- 3 South Cheshire MES.** Alan Boon: Middlewich Locomotive Works. Contact Stuart Daw: 01782 767587.
- 4 Guildford MES.** Talk: Introduction to Gauge 1. Contact Mike Sleight: pr@gmes.org.uk4
- 4 Leeds SMEE.** Malcolm High: 3D printing. Contact Geoff Shackleton: 01977 798138.
- 5 Oxford (City of) SME.** Wheatley Mill Restoration. Contact: secretary@cosme.org.uk
- 5 Sutton MEC.** Bits & pieces night. Contact Jo Milan: 01737 352686.
- 5 Warrington DMES.** Len Uff: 'That's a Big One!' Contact Duncan Webster: 01925 262525.
- 6 Brighton & Hove SMLE.** Workshop Topics. Contact Mick Funnell: 01323 892042.
- 6 North London SME.** Gordon Massey: The Railways of Brazil. Contact: Ian Johnston on 0208 449 0693.
- 6 Rochdale SMEE.** General meeting, Castleton Community Centre, 7pm. Contact Len Uff: 0161 928 5012.
- 6 Romford MEC.** Competition night. 8.00pm. Contact Colin Hunt: 01708 709302.
- 6 Stockport DSME.** Bits and pieces. Contact Dave Waggett: 0161 430 8963.
- 7 SMEE.** Alex Zivanovic: The Future of Making. Contact Peter Haycock: 01442 266050.

- 7 Tiverton & District MES.** Running Day at Rackenford track. Contact Bob Evenett: 01884 252691.
- 7 York City & DSME.** Auction Night (members only). Contact Bob Polley: 01653 618324.
- 8 Sutton MEC.** Track day from noon. Contact Jo Milan: 01737 352686.
- 9 Bedford MES.** Bring & Buy. Contact Alan Beard: 01234 301867.
- 11 St. Albans DMES.** Bob Cheesman & Tony Mason: Old Movies from Standard 8 to Digital. Railway subjects. Contact Roy Verden: 01923 220590.
- 12 St. Albans DMES.** LCGB: Donald Wilson: Railways of East Germany and Romania. Contact Roy Verden: 01923 220590.
- 12 Sutton MEC.** Richard Burkett: The Oil Industry. Contact Jo Milan: 01737 352686.
- 14 SMEE.** Basic Training Part 1, Day 1. Contact Peter Haycock: 01442 266050.
- 15 Frimley & Ascot LC.** Club running. Contact John Evans: 01276 34970.
- 16 Lancaster & Morecambe MES.** Sale Night. Contact Mike Glegg: 01995 606767.
- 16 Peterborough SME.** Chris Lyall: Afghanistan, Training Engineers. Contact Terry Midgley: 01733 348385.
- 16 York City & DSME.** Running day. Contact Bob Polley: 01653 618324.

- 17 Chesterfield & District MES.** Bits & Pieces and Quiz Night. Contact Mike Rhodes: 01623 648676.
- 17 Northampton SME.** A.G.M./Andy Waller: 50 Years at Delapre. Contact: secretary@nsme.co.uk 07907 051388.
- 17 Romney Marsh MES.** Peter Dennis: Nearly There - the Ramblings of a Novice Model Engineer. Contact Peter Lee: 01797 363466.
- 18 Bournemouth DSME.** Monthly meeting: Richard Knott's Video Show. Contact George Wheatley: 01202 825307.
- 18 Guildford MES.** Bits & pieces. Contact Mike Sleight: pr@gmes.org.uk
- 18 Leeds SMEE.** Hugh Parkin: History of Doncaster Plant Works, Part 1. Contact Geoff Shackleton: 01977 798138.
- 19 Warrington DMES.** Natter night. Contact Duncan Webster: 01925 262525.
- 20 Brighton & Hove SMLE.** Keith Carter: Isle of Man Experience. Contact Mick Funnell: 01323 892042.
- 20 Rochdale SMEE.** Bob Hayter: Railways of Brittany. Castleton Community Centre, 7pm. Contact Len Uff: 0161 928 5012.
- 20 Romford MEC.** A.G.M. 8.00pm. Contact Colin Hunt: 01708 709302.
- 20 Stockport DSME.** Mike Tanner: Tools for Self-reliance. Contact Dave Waggett: 0161 430 8963.

- 21 Chesterfield & District MES.** Public running at Hady Hill. Contact Mike Rhodes: 01623 648676.
- 21 Derby SMEE.** Club Auction, 1pm start. Contact: Richard Hill: 07881535348.
- 21 SMEE.** Digital Workshop Group. Contact Peter Haycock: 01442 266050.
- 21 Steam LS of Victoria.** A.G.M., 12 noon in the club room. Contact Graham Plaskett: (03) 9750 5022.
- 21 York City & DSME.** D. A. G. Brown: Injectors; Unravelling the Mystery. Contact Bob Polley: 01653 618324.
- 22 Steam LS of Victoria.** Working Bee. Contact Graham Plaskett: (03) 9750 5022.
- 24 Frimley & Ascot LC.** Bits & pieces. Contact John Evans: 01276 34970.
- 28 SMEE.** Malcolm Archer: Conserving George Pyke's 1765 Organ Clock. Contact Peter Haycock: 01442 266050.
- 28 Steam LS of Victoria.** Orange Soc of MES' Diesel & Electric Day. Contact Graham Plaskett: (03) 9750 5022.

MARCH

- 1 Frimley & Ascot LC.** Public running. Contact John Evans: 01276 34970.
- 1 Lancaster & Morecambe MES.** Training/Refreshers at Cinderbarrow (weather permitting). Contact Mike Glegg: 01995 606767.

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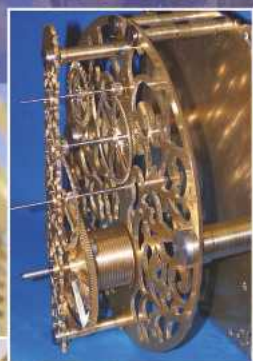
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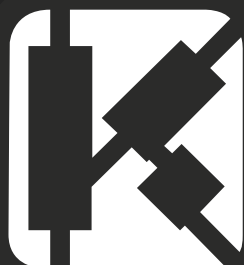
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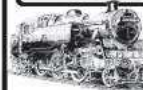
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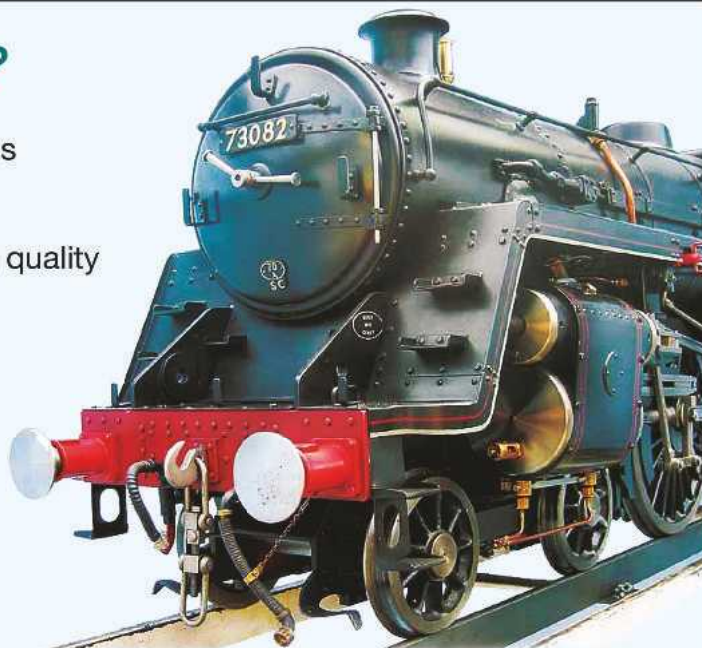
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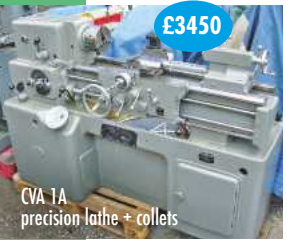
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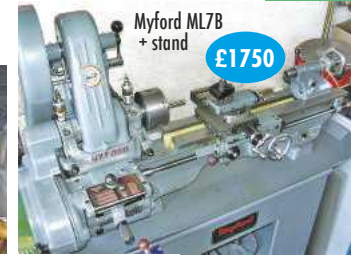
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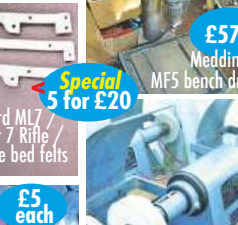


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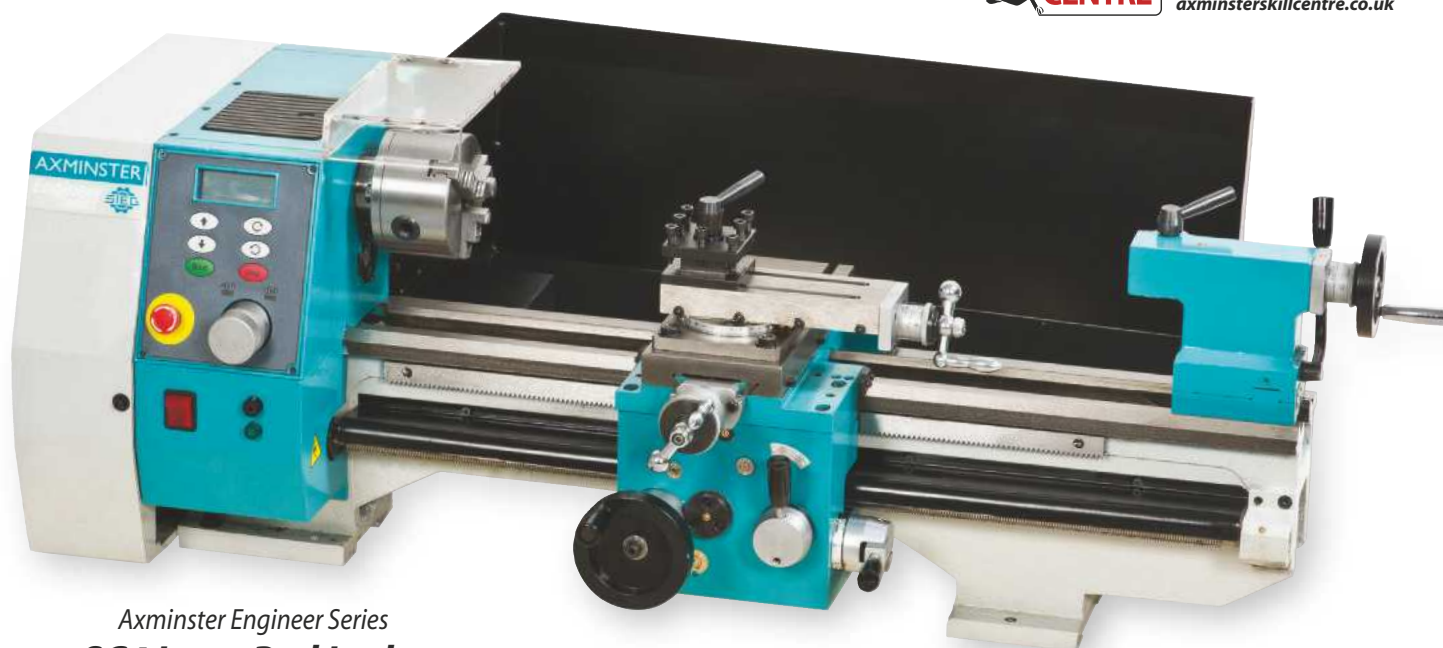
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